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Determining Public Perceptions toward Wildland Fire in the Veluwe Region of the Netherlands

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DETERMINING PUBLIC PERCEPTIONS TOWARD WILDLAND FIRE IN THE VELUWE REGION OF THE NETHERLANDS

By

AMY CHRISTINE BRENNAN, Bachelor of Science in Forestry

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ABSTRACT

The Netherlands has been facing a growing threat of wildfires due to warmer and drier weather patterns. The purpose of this study was to identify public perceptions toward wildland fire in the forested Veluwe region of the country. The Dutch have little experience with wildland fires or fire as a management tool. In a collaborative effort between Stephen F. Austin State University and the Instituut Fysieke Veiligheid, the Dutch public safety agency, a survey was distributed to residents and visitors to the Veluwe to reveal and quantify public opinions and perceptions regarding wildland fire and public expectations of government agencies in the event of a wildfire. Due to the lack of any significant historical context of wildfires, the assumption was that the Dutch do not see fire as an immediate threat. Findings from this survey revealed that visitors and residents of the Veluwe region are more aware of the wildfire problem in the Netherlands than originally anticipated. They do not see wildfires as an immediate threat to themselves, but rather a threat to nature areas within the country. Respondents to this survey also have high expectations of government agencies to inform them about wildfires.

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

"*The only thing preventing a major wildfire catastrophe in the Netherlands is the match."* – Alette Smeenk, Regional Organization for Public Safety of North and East Gelderland

The Netherlands has been facing a growing threat from wildfires. The Dutch do not have a significant historical context with wildfires and traditionally have not used fire as a management tool. Their light fire history has resulted in a lack of institutionalized knowledge among Dutch citizens regarding fire ecology, fire behavior, and what to do in the event of a wildfire. Due to warmer and drier weather patterns, there has been an increase in wildfire activity in recent years, specifically in the Veluwe region of the country. The Veluwe, a forested region in the center of the Netherlands, is located in the province of Gelderland and is a popular tourist area for Dutch and international visitors. The increased risk of wildfires paired with the dense population and visitation in this region has caused public safety authorities concern. The Instituut Fysieke Veiligheid, the Dutch public safety agency, was interested in determining and quantifying public opinions and perceptions regarding wildland fire, as well as public expectations of government agencies in the event of a wildfire to create materials and programs educating the public on wildfires. To engage and educate the public,

how they currently think regarding wildland fires and how to respond to them must first be determined.

Throughout this document, the words “fire,” “wildfire,” “wildland fire,” and “bushfire” may all be used interchangeably, unless otherwise specified. These terms all refer to a fire occurring on the landscape that was not intentionally set by fire and/or nature managers. “Prescribed fire,” “patch burn,” and “prescribed burn” all refer to a fire intentionally set by fire and nature managers under closely monitored conditions.

OBJECTIVES

The overall goal of this research was to provide Dutch public safety agencies data quantifying public perceptions and opinions of wildfire so that educational materials can be created. The specific research objectives of this study were to:

1) Determine the level of understanding visitors and residents to the Veluwe have about wildfire.

2) Identify and quantify public opinions toward wildland fire.

3) Identify and quantify public expectations of government agencies in the event of a wildland fire.

4) Determine if there are significant differences in opinions between different types of recreationists and local residents.

LITERATURE REVIEW

Dutch Demographics and Culture

The Netherlands, located in Western Europe, is the main country of the Kingdom of the Netherlands. The Netherlands borders Germany to the east, Belgium to the south, and the North Sea to the northwest. The Netherlands is small (approximately twice the size of New Jersey) and, according to the 2011 Dutch census, has a population of over 16.6 million people, making it one of the most densely populated countries in the world with a population density of 410.6 people per square kilometer (Statistics Netherlands, 2014). The Netherlands is the 31st most densely populated country in the world, while only South Korea, Taiwan, and Bangladesh have both larger populations and a higher population density. The Netherlands literally translates as the "low countries," a fitting name with such low elevations and nearly 17% of the current land mass having been reclaimed from the sea.

According to the 2012 Edelman Trust Barometer, the Netherlands is classified as one of the countries where citizens have the most trust in their government, business, Non-Government Organizations (NGOs), and media. The Netherlands is also considered "trust steady" toward government, businesses, and the media, implying that the trust in these entities has remained consistent in recent years (Organisation for Economic Cooperation and Development, 2013). Trust in

government and businesses is very important, and has been said to be essential for effective policy making in good and bad economic times.

The United States Forest Service Northern Research Station combines housing density data and “wildland vegetation” data to determine what classifies as wildland-urban interface (WUI). Their definition includes forests, native grasslands, shrubs, wetlands, and transitional lands as wildland vegetation. WUI occurs when housing areas are within the vicinity of wildland vegetation. The California Fire Alliance defines vicinity as within 2.4 kilometers of wildland vegetation (California Fire Alliance, 2016). Under this definition, the vast majority of private property in the Veluwe would be considered as WUI.

Europe and Fire

Forest fires are a major concern in Europe, particularly in southern European countries. While the total burned area in Mediterranean Europe changes significantly from year to year, 85% of burned area in Europe annually is in Portugal, Spain, Italy, Greece, and south of France (Ciscar et al., 2014). Approximately half a million hectares of forest areas are burned during the 65,000 fires that occur annually in Europe (European Commission, 2011). Since 1998, the European Forest Fire Information System (EFFIS) has provided a platform for Europe and neighboring countries to record forest fire data and exchange information on fire prevention. In 2012, the Netherlands designated

national experts to become members of the EFFIS' Expert Group on Forest Fires and was for the first time included in the EFFIS annual report on forest fires (European Commission, 2011).

In 2010, the European Lifelong Learning Programme awarded a grant to a partnership of universities from five countries (Romania, Hungary, Estonia, Spain, and the United Kingdom) to develop a distance learning program for fighting forest fires. Those five countries recorded over 21,500 fires between 2004 and 2007, which resulted in over €35 million in declared damages (Education, Audiovisual and Culture Executive Agency, 2010). The wildfire issue has been acknowledged and addressed in some capacity throughout Europe.

In central European countries, the use of prescribed burning is typically focused on management of endangered habitats and conservation of open landscapes (Goldammer et al., 2007). Germany began experimenting with prescribed burning in 1977 and since that time, multiple initiatives have been developed to manage viticulture landscapes, restoration projects, fuel management and forest biodiversity in pine stands, and to manage pasture and grouse habitats (Goldammer & Bruce, 2004). Denmark began to utilize prescribed burning as a restoration tool in vulnerable coastal dunes and dune heathlands upon the realization that mosaic burning was a sustainable management method to re-establish natural dynamic processes in these ecosystems (Jensen, 2004). In the United Kingdom, in addition to traditional

practices of burning heathland, prescribed fire is also being used to improve habitat for the woodland grouse (*Tetrao urogallis*) in Scots pine (*Pinus sylvestris*) stands (Bruce & Servant, 2004). Sweden annually burns 50-200 hectares for biodiversity management (Montiel & Kraus, 2010). Prescribed burning is being utilized for multiple management objectives throughout Europe, and the Netherlands may benefit from expanding its usage of prescribed burning.

Dutch Wildfire History

Wildfires occur regularly in the Netherlands and are usually small and easily-contained, but occasionally become large and uncontrollable (Smeenk, 2011). The Dutch experienced large, uncontrollable wildfires near ‘t Harde in 1970, on Rozendaalse Veld near Arnhem in 1976, and near Kootwijk in 1995 (Smeenk, 2011). More recently, the Netherlands have experienced large wildfires in the dunes fires in Bergen and Schoorl in North Holland from 2009 to 2011, on the Drenthe Fochteloerveen and Aamsveen in 2011, at Radio Kootwijk and Hoog Soren in 2012 and 2013, and finally, the Easter fire in the Hoge Veluwe in 2014.

Recent research has shown that it can be quite likely that a wildfire will become uncontrollable. In the Veluwe, this chance averages 4% a year, but in dry periods increases to 50%, which means that half of all wildfires starting on the Veluwe during dry years will become uncontrollable (Smeenk, 2011).

No large-scale human dimensions of wildfire research has been conducted in the Netherlands. In September 2012, a northern safety region conducted a survey in wet-moorland Dwingelderveld National Park located in the Dutch province of Drenthe (E. Klap, personal communication, June 2014). Researchers divided users into two groups: permanent users and temporary users, which prompted this survey focusing on business owners, residents, and recreationists. Researchers found that users of the Dwingelderveld received very little information related to wildfires (E. Klap, personal communication, June 2014). They also concluded that users of the Dwingelderveld have many expectations for the commitment of the government during wildfires, which leads to them having low expectations for their capacity to handle wildfire activity. The authors of this research proposed that an awareness program entitled “What to expect from the government and what you can do yourself” be created and available to all individuals (E. Klap, personal communication, June 2014).

Dutch Wildfire Management and Ecology

Unlike the United States, the Netherlands does not have a significant historical context for fire and is certainly not seen as a major fire nation. It is considered highly likely that the majority of wildfires in the Netherlands are human-caused, though exact data on this do not exist (Smeenk, 2011). In July of 1976, the Dutch experienced one of their most significant wildfires, and the most

important recent fire was the Easter Fire of 2014. During this fire, 7.9 hectares of forest and 314 hectares of scrub land were burned (Gelderland, 2014).

In the Netherlands, restrictive legal frameworks (e.g. requiring special permits) have reduced prescribed burning so much that it is not a real management tool in practice (Montiel & Kraus, 2010). Prescribed burning is utilized in military areas to maintain open heathland because sod-cutting and mowing cannot be utilized in these areas due to unexploded ammunition (Montiel & Kraus, 2010). Dutch land managers are often concerned with increasing biodiversity. To meet this goal, piles of woody debris will be left scattered throughout the forests. They also will perform very small patch burns in the hopes to increase biodiversity (M. Schuijn, personal communication, June 2015).

Oswald and Stoof (2012) conducted the first fuels research in the Veluwe region of the Netherlands. The vegetation types sampled included heather, grasslands, beech/hardwood forests, Scots pine, and Douglas-fir. The research concluded that the grasslands present in the Veluwe would likely burn quickly and at high temperatures in drought conditions. The research concluded similar fire risks in all vegetation types. Oswald continued the studies in 2013 and 2014, concluding similar risks throughout the Netherlands (Oswald & Brouwer 2013, 2014).

Researchers at the Instituut Fysieke Veiligheid have been working to create a Wildfire Distribution Model to simulate the expansion of wildfire over time

(Willemsen & Brouwer 2015). This model is based on the FARSITE fire spread model and will help Dutch firefighters and wildland fire managers to better understand how wildfire will behave on the landscape (Willemsen and Brouwer 2015). This model is utilizing data collected from the Oswald studies.

The Veluwe

The Veluwe is a forested region of hills in the province of Gelderland of the Netherlands. Centrally located, it has many recreational attractions, making it a popular destination among Dutch tourists. There are over 1.9 billion domestic visits by the Dutch to the Veluwe each year, as well as an additional 215,000 foreign visitors ("Veluwe", 2016). Most tourism occurs during the summer months when the wildfire risk is highest. The Veluwe consist of coniferous and deciduous forests (beech [*Fagus orientalis*], Scots pine [*Pinus sylvestris*], Douglas-fir [*Pseudotsuga menziesii*]), Europe's largest sand drifts, heath, and grassland, as well as agricultural and urban land uses. Wildlife such as wild boars (*Sus scrofa*), red deer (*Cervus elaphus*), snakes, pine martens (*Martes martes*), as well as many avian species live in the Veluwe (Veluwe 2016). The Netherlands has invested in building wildlife crossings, also known as ecoducts, over highways to allow wildlife species to cross (Van Bohemen, 1998).

The Veluwe was selected as the study area primarily because the majority of Dutch wildfires occur there. The region has a land area of approximately 110,000

hectares, which is approximately one-fifth of the total land area in the province of Gelderland. The largest attraction in the Veluwe is the Hoge Veluwe National Park (Nationaal Park De Hoge Veluwe), which is one of the largest continuous nature reserves in the Netherlands measuring over 5,400 hectares (“Veluwe” , 2016). The park has been a continuously protected site since 1909 (Hein 2011). In 2015, there were over 578,000 visitors to the Hoge Veluwe National Park (“Hoge Veluwe National Park”, 2016). The 300 hectare Easter fire of 2014 gained significant media attention due to the threat it was posing to the Kroller-Muller Museum. This museum contains the largest private collection of paintings by Vincent van Gogh (“De Hoge Veluwe” 2015).

A study by Lars Hein in 2011 measured the economic benefits generated from the Hoge Veluwe National Park, including all major ecosystem services which are: (1) wood production, (2) supply of game, (3) groundwater infiltration, (4) carbon sequestration, (5) air pollution removal, (6) recreation, (7) recreational hunting, and (8) biodiversity conservation. The study concluded that the total economic value generated by the services supplied in the park, as a conservative estimate, is approximately € 10.8 million per year, or approximately € 2000 per hectare per year (Hein, 2011). All eight major ecosystems services could be impacted by a major wildfire, thus significantly lessening the economic benefit of the park.

Climate Change Effects

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change projects the Dutch provinces of Gelderland, Utrecht, Limburg, and North Brabant as “high” risk for forest fires starting in 2041, compared to the “medium” forest fire risk of the baseline climate (1961-1990) (Kovats et al., 2014). In the 2008 Dutch National Risk Assessment (DNRA), the wildfire scenario was given a likelihood of “likely” with anticipated “limited consequences” for fatalities, serious injuries, chronic illnesses, and costs, “substantial consequences” for territorial integrity and environment and nature, and “serious consequences” to physical suffering (lack of necessities), disturbance of daily life, and socio-psychological impact. The DNRA also classifies wildfires as likely with a considerable conceivability. The evidence points to wildfires becoming a more frequent problem in the Netherlands. Unlike most natural disasters, wildfires are a result of both natural and human factors, which leads to less predictability. Therefore, the human dimensions of wildfire risk cannot be ignored.

Results of the Wildfire Investigation of 2011

In 2011, Richard Woods (Australia) and Paul Steensland (USA) investigated wildfire causes and existent wildfire training to Dutch agencies. It was determined that fire suppression techniques in the Netherlands focus more on suppression techniques as opposed to the origin and cause of wildfire activity (Woods &

Steensland, 2011). To help educate fire suppression first responders, the National Wildfire Coordinating Group (NWCG) developed and distributed a 4-6 hour training course over how to identify potential witnesses, identify and protect the fire's general origin area, and locate and secure physical evidence. The authors recommended the training be delivered to all first responders and supervisors as quickly as possible (Woods & Steensland, 2011). Since this time, members of the Brandweer have incorporated several new pieces of training, equipment, and tactics. The majority of wildfires in the Netherlands appear to be human-caused (long-term serial arson) (Woods & Steensland, 2011).

While responding quickly to existing wildfires is vital to the protection of the Dutch people and structures, this is only part of the larger issue. For decades, fire managers in the United States tried to remove fire entirely, and this drastically altered the landscape while largely failing in the prevention of wildfire activity (Pyne, 2004). The fuel load must be addressed to properly prevent wildfires in the Veluwe as well as the dunes regions along the coast.

Global Human Dimensions toward Wildland Fire

Risk and Hazard

An important concept to understand in regards to the human dimensions of wildland fire is the difference between hazard and risk. A hazard is an adverse event or situation while risk is the combination of the nature and consequences

of an event and the likelihood of its occurrence (O'Riordan, 1986). Furthermore, a natural event becomes a natural hazard when it affects society (Rodrigue, 1993). O'Riordan also notes that hazard-prone occupancy appears to be increasing both in developed and developing countries, despite improvements in hazard-prediction technologies and in the organization of relief agencies. Understanding hazard and risk is complex, which is why some have attempted to better define "understanding" so that risk communications can be fairly evaluated. Decisions about personal risk minimally require information about the nature and likelihood of potential ill effects, information about the risk factors that modify one's susceptibility, and information about the ease or difficulty of avoiding harm (Weinstein, 1999). Weinstein also noted that people generally do not see risks to themselves as severe as those faced by others. Given this information, it is vital that agencies communicate effectively and efficiently about hazards and risks. Steelman and McCaffrey decided on five characteristics of effective communication: engage in interactive processes or dialogue to understand risk perspectives and how they might be addressed; strive to understand the social context so that message and content can fit the appropriate circumstance; provide honest, timely, accurate, and reliable information; work with credible sources who have local legitimacy, including authority figures where appropriate; communicate before and during crisis to leverage established relationships (Steelman & McCaffrey, 2012).

Preparedness

The benefits of being well-prepared for risks, both mentally and physically, are obvious. A well-prepared individual will be more likely to protect their family and property during a natural disaster and will also be able to recover more quickly from such a disaster. However, “well-prepared” is a term often used but not so frequently clearly defined. Being “well-prepared” comes down to three main themes: (1) emotional control (staying calm, not panicking, maintaining control), (2) understanding the psychological strain (the psychological stress of noise, smoke, and heat in the case of wildfires), and (3) being prepared (to implement an organized and practiced plan) (Eriksen & Prior, 2013).

Common Discourses and How Humans View Nature

The manner in which humans manage natural disasters is shaped by the way the culture views nature (Neulip, 2012). Natural disasters are a social occurrence as much as they are a natural one because an individual’s vulnerability to a disaster is rooted in the social system and hierarchy to which they exist. For example, women tend to be disproportionately affected by disasters due to the unequal power distance between men and women in various cultures (Fisher, 2010).

Global cultures can generally be described as having one of three orientations toward nature: that people are subjugated to nature, that they are an inherent

part of nature, or that they are dominant over nature (Kluckhohn, 1953). The Indian culture tends to see humans subjugated to nature, as evidenced by their belief that nature dictates the health and happiness of people. The Sri Lankan culture believes humans are an inherent part of nature, which is common in countries with roots in Buddhism (Morrison & Conway, 2006). Many people in Western cultures adopt the view that humans are dominant over nature, evidenced by many countries that utilize natural resources for much of their economic activity.

A common way of analyzing and categorizing how humans view a certain issue is through discourse analysis. As defined by Dryzek (1997), discourse is a shared way of apprehending the world. Embedded in language, it enables those who subscribe to it to interpret bits of information and put them together into coherent stories or accounts. Each discourse rests on assumptions, judgments, and contentions that provide the basic terms for analysis, debates, agreements, and disagreements. Discourse analysis conducted in Spain and Australia identified different discourses related to how humans view wildfire. In Catalonia, Spain, a region dominated by large wildfires in the past decade, five discourses were identified: the capitalist discourse (nature as a source of utility with people, property, and infrastructure as top priorities in a fire), the rural idyllic discourse (local, nonindustrialized communities living in harmony with nature utilizing local knowledge), the green discourse (divided by environmentalists and the Natural

Park Authority), and the resilience discourse (which is similar to the rural idyllic, but accepts that nature is unpredictable) (Gonzalez-Hidalgo, 2014). The discourse analysis conducted in Australia following the Victorian bushfires of 2002-2003 identified three discourses, the conservationist, the ruralist, and the wise use (Whittaker & Mercer, 2004). The conservationist discourse sees bushfires as natural and inevitable. The ruralist discourse sees bushfires as monstrous and out of control. The wise-use discourse wants to utilize land for multiple uses and places blame on environmentalists for fire risks. All of the aforementioned discourses come down to the same three interpretations of the human-nature relationship, but some dissect further by including political ideologies as well. It can be assumed that these three human-nature relationships and, therefore, some of these discourses, could be applied to the Dutch.

Firewise

The Firewise program in the United States began after the fire season of 1985, where over 1,400 homes were lost in California and Florida (Fuglem, Hirsch, & Bothwell, 2006). After a conference in 1986, WUI stakeholders signed an agreement that created the National Wildland-Urban Interface Fire Protection Initiative. This initiative provided WUI stakeholders, the public, and firefighters with information on how to protect themselves and their property. The National

Wildfire Coordinating Group was also created from this initiative, and consists of all of the Department of Interior's land management agencies (National Park Service, Bureau of Land Management, Bureau of Indian Affairs, and the United States Fish and Wildlife Service), the United States Forest Service, the National Association of State Foresters, the National Fire Protection Association, the United States Fire Administration, the National Emergency Management Association, the National Association of State Fire Marshals, and the International Association of Fire Chiefs.

The Netherlands has an existing Inter-Administrative Wildfire Cooperation consisting of the IFV and the National Core Group on Wildfires (Smeenk, 2011). This has been created to establish a hierarchy and responsibility chain in regards to wildfires in the Netherlands.

In the Netherlands, the fire department (the Brandweer), is primarily responsible for all firefighting activities while in the United States, there are significant differences between structural firefighters and wildland firefighters (Pyne, 2004). Dutch government agencies, such as the IFV and regional safety regions, will typically act as a control room for wildfires.

Impact of Natural Disasters

It is a widely accepted belief that traumatic experiences have long-term effects on individuals, an idea first studied by Sigmund Freud (Laplanch &

Pontalis, 1967). Children and adults can recall many accurate details from a natural disaster over a year after the event (Pezdek & Taylor, 2002). Participation in the event produces better memory for the event than second-hand information does, which has prompted this study to determine awareness and preparedness rates among individuals directly involved in a wildfire compared to those who were told of the event afterward.

Individuals in the United States and the Netherlands both remember natural disasters and their impacts, particularly in regards to coastal engineering. The Netherlands and the United States are interestingly juxtaposed in regards to their histories of fire and flooding. In the wake of hurricanes Katrina and Rita in 2005, New Orleans, Louisiana, as well as many other areas along the American Gulf Coast, were left devastated and flooded. Many individuals looked to the Dutch to understand how this small country thrived while living largely under sea level, operating under the assumption that the Dutch were more competent at coastal engineering. Wiebe Bijker argues that the difference is not one of expertise or competence, but a difference of risk management and technological culture (Bijker, 2007). Bijker begins by comparing the internal histories of coastal engineering in both countries by referencing the American and Dutch papers that came out of the 50th International Conference on Coastal Engineering ([Bijker, 1996] for the Netherlands, [Wiegel & Saville, 1996] for the United States). The Dutch paper features the role of citizens much more strongly than the American

paper. It also discusses the history of water boards, committees designated to manage and maintain levees and sluices, which consisted of every type of citizen. In 1280, Floris V, former Count of Holland, ruled that everyone, “the monastery, the knight, the priest, the common man, everybody alike,” had to pay for the maintenance of the dikes (Bijker, 2007). In this regard, the Netherlands is institutionally democratized and focuses on engineering practice, while the United States places much greater emphasis on scientific research conducted by certain agencies, such as the Beach Erosion Board and the US Army Corps of Engineers (Bijker, 2007). These two countries also place more emphasis on natural disasters than the other thirteen countries involved in this conference. They look at the history of storm surges, floods, and hurricanes as key elements in the development of coastal engineering practices. Wiegel and Saville acknowledge that disasters can increase public awareness and prompt research.

No history of natural disasters in the Netherlands is complete without mentioning De Ramp, translated into English as The Disaster. In February of 1953, a long storm with a sudden change of direction resulted in the dikes of Zeeland breaking. 1,835 people lost their lives, a quarter of a million people were affected, and 400,000 acres of land were inundated with water (Bijker, 2007). This disaster lead to the creation of the Zuiderzee Works and the Delta Works, an intricate system of dikes, dams, sluices, locks, levees, and storm surge

barriers that has been declared one of the Seven Wonders of the Modern World by the American Society of Civil Engineers.

The central pillar of Bijker's argument is that the American practice focuses on predicting disasters and mediating the effects once they have occurred while the Dutch practice is aimed at keeping water out. The United States looks at flood hazard mitigation and prediction, which suggests that flooding is accepted as an inevitability. The United States uses a 1:100 chance (a hundred year flood) as the criterion for designing levees and other coastal defense structures, whereas the Netherlands uses a 1:10,000 chance, which is directly written in the Delta Law (Bijker, 2007). Bijker also insists that the differences exist in style, not necessarily in the quality. They are different, but neither is better than the other. He points out that after the flooding of New Orleans in 2005, an evaluation of Dutch evacuation plans showed that they were insufficient, and suggests that the Dutch could learn hazard mitigation techniques from the Americans.

Bijker boils down his arguments to differences in technological culture between the two countries. The Netherlands, which can easily be characterized as a water nation, has a political culture that is more accepting of a central role of the national government in all facets of society. The United States, however, is much more inclined toward privatization of public functions. He also suggests that coastal engineering is ingrained in the Dutch mindset and that the public is more knowledgeable on the basics of coastal engineering. He concludes with the idea

that active engagement from civil society and changing of relevant political culture is what can ultimately bring about changes in water management (Bijker, 2007).

How then do these ideas relate to the wildfire issue? The United States is a fire nation, similarly to how the Netherlands is a water nation. The United States has a diverse, studied, and storied history with wildland fire. Water, the presence and absence of it, has weaved the landscape mosaic of the Netherlands while fire has done the same in the United States. In the United States, Native American tribes, farmers, and ranchers would utilize fire as a management tool before a tactic of complete suppression was implemented by the government during the early 20th century, a practice now recognized as detrimental to many ecosystems in the United States (Pyne, 2004). In the Netherlands, historically local water boards would take responsibility for flood control, but in the modern age, it is primarily controlled by the government. In both instances, previous local knowledge laid the foundation for the current management framework.

METHODOLOGY

Survey Development

The survey design process began with a modified version of a revised Schindler survey (see Appendix D) provided by Dr. Sarah McCaffrey of the United States Forest Service Northern Research Station in Evanston, Illinois. After a meeting in June of 2014 with the Dutch agency participants, this survey was adjusted several times to meet the needs of the Dutch partners. Many questions in the original survey focused on fire ecology and fire effects on the landscape, and those were replaced with more questions about the human dimensions of fire, such as public safety and response to wildfires. A survey (see Appendix C) conducted in the Dwingelderveld region of the country in 2012, provided by Esther Klap of the Brandweer Drenthe, was reviewed and certain aspects of it were adopted into this survey. Parts of questions 4, 8, 11, 13, 14, 15, and 16 were adapted from this survey but were not copied verbatim. Once the final draft of the survey was completed, the survey was translated into Dutch by Ellart Vreugdenhil. To ensure that the English and Dutch versions were as similar as possible, the survey was also back translated into English after the Dutch translation was complete. The final English and Dutch versions of the survey are Appendices A and B. The survey had 24 questions, with sections

focusing on demographics, visitor use information, wildfire awareness, and wildfire preparedness/expectations of the government. Questions 1-7 focus on the respondent's relationship with the Veluwe and with nature. Questions 8-14 focus on wildfire awareness and perception. Questions 15-20 focus on wildfire preparedness and expectations of the government. Questions 21-24 are basic demographic questions.

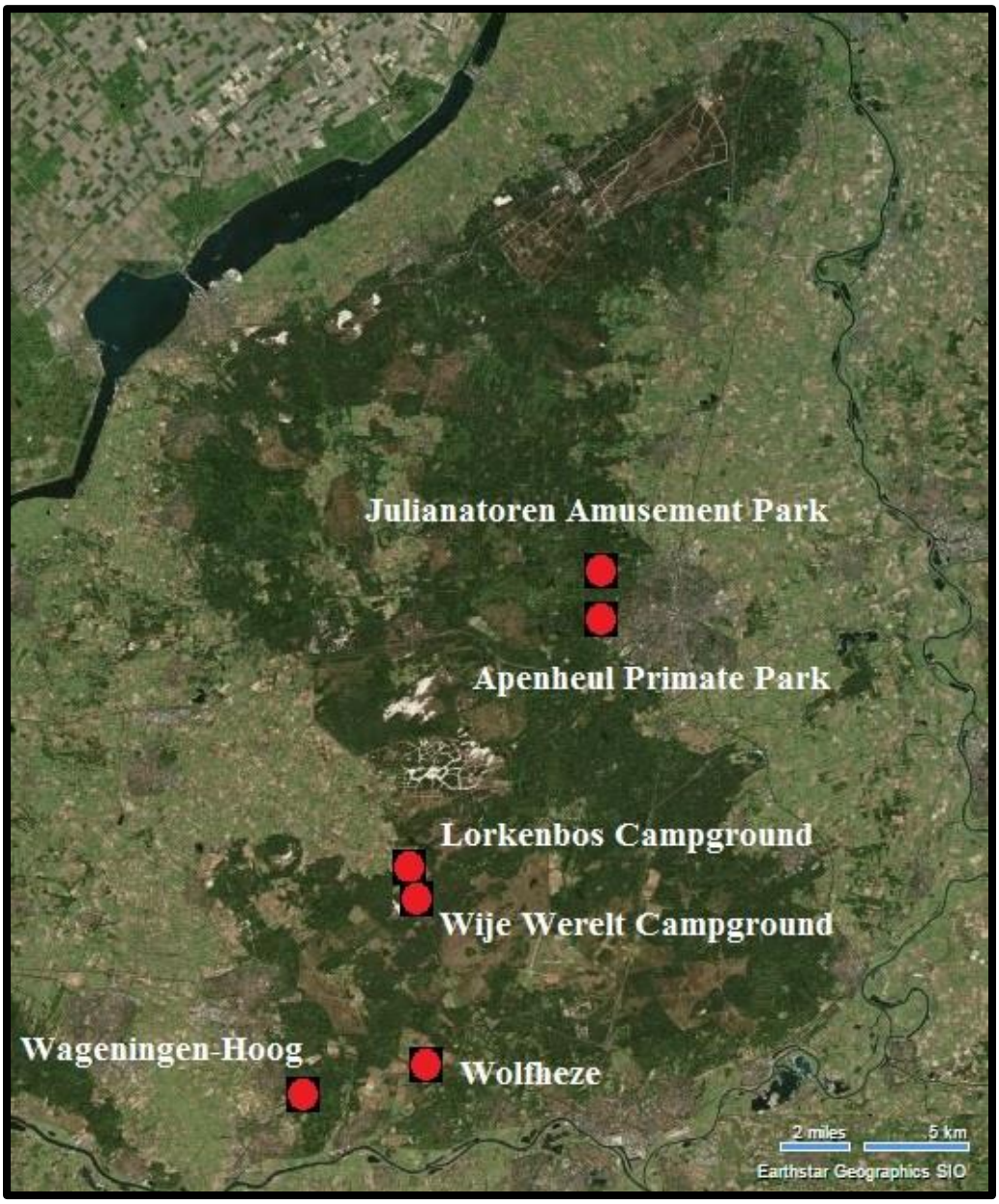
Site Selection

Surveys were distributed at three different types of locations: villages, attraction parks, and campgrounds. The sites were selected by the IFV because they are embedded within the forests of the Veluwe and therefore more susceptible to damage from wildfires. None of the sites are adjacent to a large highway. Owners of these locations were contacted for permission to use their site by the IFV prior to July 2015. Location of each site in the Veluwe is shown in Figure 1.

The survey was distributed in two small villages, Wageningen-Hoog and Wolfheze, to determine the beliefs and opinions of local residents. Both villages are a smaller part of two larger municipalities and have less than 2,000 inhabitants. The two attraction parks surveyed include the Apenheul Primate Park and the Julianatoren Amusement Park, both in Apeldoorn. The Apenheul Primate Park is located within the larger nature reserve Natuurpark Berg and Bos

(Nature Park Mountain and Forest) and is home to over 200 free-roaming primates. The Julianatoren Amusement Park receives about half a million visitors per year and is a popular destination for families with small children. Visitors to Julianatoren park approximately one kilometer west of the park gates and are shuttled to the entrance. The park is surrounded on all sides by several acres of forest. These two compounding issues would make evacuation efforts difficult. The two campgrounds surveyed were the Lorkenbos campground and the Wije Werelt campground, both near Otterlo. Visitors at both campgrounds have a wide variety in length of stay. Most visitors stay anywhere from a weekend to a few weeks, but there are also semi-permanent residents that live there over half of the year.

Figure 1. Six sites surveyed in the Veluwe region of the Netherlands during July of 2015.



Survey Administration

A Dutch student, an undergraduate student from Stephen F. Austin State University (SFASU), and a trainee and intern at the Instituut Fysieke Veiligheid (IFV) aided in the distribution of the surveys, under the instruction and supervision of the SFASU graduate student. The Dutch partners at the IFV recommended that if asked who is conducting this study and why, to inform the individual that this project is for the graduate research of a student from Texas. Only persons 18 years of age or older were allowed to take the survey. Certain variables, such as the number of participants who decline to take the survey, the weather on distribution day, and the gender and age of participants were recorded by distributers to examine non-response data. As the distributors collected the surveys, they wrote their initials on the back of the survey. All original surveys were scanned and brought back to the United States.

At the two small villages, the individuals distributing the survey utilized the "drop-off, pick-up" method of survey collection and went door-to-door and requested the residents to take the survey and inform them that they (the distributors) would return in approximately thirty minutes to collect the survey. At the campgrounds, the distributors went campsite-to-campsite requesting campers to complete the survey. As with the villages, the participants were

informed that the distributors would pick up the survey in approximately thirty minutes. Apenheul granted permission to survey visitors as they entered and exited the park, but not within the park. Visitors entering the Apenheul had the opportunity to fill it out at tall tables that were set up at the entrance or take the survey with them into the park and returned it upon exit. Due to the nature of survey distribution at Apenheul, non-response data were not collected at this location. Julianatoren had several areas with tables, so the surveys were handed out there while visitors were sitting watching their children play or while they ate. The survey was also handed out to visitors waiting in line for a ride or attraction and as they rested from walking.

During data collection, a Dutch language professor pointed out that there were two minor grammatical errors in the Dutch version of the survey. In the introductory paragraph, the phrase “educatief-materiaal” is missing the hyphen. Similarly, the phrase “recreationale-activiteiten” in question 7 is also missing the hyphen. The professor, as well as several other survey participants, reported that they could identify that the survey was originally written by an American.

Questions 19 and 20 were often misinterpreted by survey participants. Participants were asked to answer 19 and 20 if they answered “yes” to question 18, which asked them if they were aware of the color-coded wildfire thermometer. One out of every four participants that answered “no” proceeded to fill out question 19 and 20. Eighty-five participants answered “yes” to question 18, and

15 of those individuals answered question 20 illogically. Question 20 asked participants to rank their likelihood of changing their plans to visit an area given a certain wildfire thermometer color (green, light green, yellow, orange, and red). While some of these 15 individuals could possibly be fire-chasing daredevils, it is unlikely that an individual would be more likely not to visit an area if the wildfire threat was lower (green). The discrepancies in responses to this question resulted in exclusion from statistical analysis.

Data Collection

A total of 521 surveys were collected between July 7th and July 19th of 2015. A total of 187 surveys were collected from Julianatoren, 84 from Apenheul, 77 from Wageningen-Hoog, 59 from Wolfheze, 68 from Wije Werelt, and 46 from Lorkenbos (Table X). A total of 514 respondents filled out the Dutch version of the survey, while seven filled out the English version. Fifteen surveys were eliminated from analysis due to being 25% or more incomplete. Of the remaining 506 surveys, 112 were from the two campgrounds, 129 were from the two villages, and 265 were from the amusement parks (Table 1).

Table 1. Location, location type, and distributor information from the 506 useable surveys collected in July of 2015 in the Veluwe region of the Netherlands.

Characteristic	N	Percent	Cumulative Percent
Location			
Wije Werelt	67	13.2	13.2
Lorkenbos	45	8.9	22.1
Wageningen-hoog	72	14.2	36.4
Wolfheze	57	11.3	47.6
Julianatoren	183	36.2	83.8
Apenheul	82	16.2	100.0
Location Type			
Campground	112	22.1	22.1
Village	129	25.5	47.6
Amusement Park	265	52.4	100.0
Distributor			
AB	180	35.6	35.6
MG	212	41.9	77.5
MK	89	17.6	95.1
MC	15	3.0	98.0
EV	10	2.0	100.0

AB = Amy Brennan, MG = Michiel Gortzak, MK = Margo Karemaker, MC = Matt Cross, EV = Ellart Vruegdenhil

Six different individuals aided in distribution of the survey, four of whom spoke fluent Dutch and English, and two only English speakers. Approximately two-thirds of the surveys were distributed by native Dutch speakers, while the remaining third were distributed by English-only speakers from the United States

of America. Cross-tabular analyses were conducted comparing the language of the distributor to each question to determine if there were any strong relationships between how an individual responded and the distributor's native tongue. All symmetric measures (phi, Cramer's V, and Kendall's tau-b) were either very weakly or weakly correlated (<0.200).

Statistical Analysis

The survey data were input directly into a database in Professional Version 23 SPSS Statistics software for analysis. The survey contained one open-ended response question which was recorded in both the original language and the translation in English. The responses to this question were then re-coded into seven categories based on commonalities in the responses. Data entry was checked for accuracy by randomly selecting 20% of the surveys and manually reviewing the data entry. The general proposition is that the majority of respondents will demonstrate a low understanding of wildfire awareness and preparedness.

To examine nominal and ordinal relationships, cross-tabulations coupled with chi-square analysis were used. To examine nominal relationships, measures of association and Cramer's V were utilized. Cramer's V was also utilized to examine relationships between nominal and ordinal variables. Guidelines for determining the strength of the absolute value of all measures of association are

as follows: 0.000 represents no relationship, 0.001 to 0.199 represents a weak relationship, 0.200 to 0.399 represents a moderate relationship, 0.400 to 0.599 represents a strong relationship, 0.600 to 0.999 represents a very strong relationship, and 1.000 represents a perfect relationship. An alpha of 0.05 will be used for inferential tests.

Guidelines for determining proper measures of associations, usual measures of central tendency, qualifications for badly skewed distributions, and strength of relationships utilized for reporting the results of this survey were found in Robert Szafran's *Answering Questions with Statistics*.

Non-Response

Non-response data were collected by each survey distributor. Data collected included the date, time of day, weather conditions, temperature (in degrees Celsius), name and language spoken of the distributor, location, location type, the gender of participant, and the approximate age group of the participant. Distributors chose between young, middle-aged, and older adult for age. Weather patterns were classified as cloudy, rainy, and sunny, but given the drastically changing weather on distribution days, these data were not analyzed. Due to the nature of survey distribution at the Apenheul Primate Park, no non-response data were collected at this location. There were nineteen usable non-response data sheets collected on nine different dates. Three data sheets were lost, two from Wolfheze and one from Julianatoren.

A total of one hundred and thirty people declined to participate in the survey. Almost half of the individuals who declined to take the survey were older adults (47.2%). Nearly two-thirds (63.1%) of declinations were from females.

RESULTS

Basic Demographics

The 506 survey respondents represented 10 different countries including the Netherlands (489 respondents), Australia (1), Belgium (4), Canada (1), Ecuador (1), Germany (4), Israel (1), Italy (1), Qatar (1), and the United States of America (1). As shown in Table 2, there were more female respondents than male, with 52.5% of the respondents identifying as female, with the remaining 47.5% identifying as male. Approximately half of the respondents identified as being originally from a rural area and the other half of respondents identified as being originally from an urban area (Table 2). Respondent age ranged from 18 to 89 years old. The mean age was 49 while the median age was 46. Respondents were divided into four different age groups for analysis by determining natural quartiles among the data. The four age groups were (1) 18 to 35, (2) 36 to 45, (3) 46 to 61, and (4) 62 and older.

Respondents were asked to list their postal codes, which are all cumulatively listed in Appendix E.

Table 2. Gender, age group, and upbringing type of the 506 useable surveys collected during July of 2015 in the Veluwe region of Netherlands.

Characteristic	N	Percent	Cumulative Percent
Gender			
Male	239	47.5	47.5
Female	264	52.5	100.0
Age Group			
(1) 18-35	122	24.3	24.3
(2) 36-45	124	24.7	49.0
(3) 46-61	125	24.9	73.9
(4) 62 and older	131	26.1	100.0
Upbringing			
Rural	250	49.7	49.7
Urban	253	50.3	100.0

Relationship with the Veluwe and Nature

The survey instrument included six questions to identify the relationship each individual had with the Veluwe and with nature. These questions focused on factors such as frequency of time spent in the Veluwe and time spent in nature, common outdoor recreational activities, and their self-described relationship with the Veluwe.

When asked to describe their relationship with the Veluwe, participants had three options to choose from, including (A) I live here; (B) I own a business here, and; (C) I am on a holiday/day trip here. Only 3% of respondents reported

owning a business in the Veluwe. There was a very strong relationship (Cramer's $V = 0.947$; $p < 0.001$) between those who live there and those on vacation there. Respondents were instructed to choose all options that applied to them, but the vast majorities were either residents or visitors. About one-third of respondents reported living within the Veluwe and two-thirds were on a holiday/day trip in the Veluwe. About five percent responded that both options applied to them.

When questioned on the frequency in which participants spent time in nature during the past two years, less than one percent of participants reported spending no time at all in nature during the past two years (Table 3). One-fourth reported a few times per year. Slightly more than one-fourth reported a few times per month. Almost half reported one or more times per week.

Participants were asked how often they have gone on a holiday/day trip to the Veluwe within the past two years. About one out of every five participants reported that they do not go on a holiday/day trip in the Veluwe (Table 3). Most participants (57.1%) reported a few times per year and 14.1% reported a few times per month. Almost ten percent (9.7%) reported one or more times per week. The median was "a few times per year."

In addition to the frequency of time in nature and the Veluwe, participants were asked if they had vacationed in nature in the past two years and if they received information about wildfire prevention. A majority (58%) of participants

reported that they had vacationed in nature in the past two years. Only 12.2% reported that they had received information about wildfire prevention.

Table 3. Valid percentage, frequency, and total number of cases reported of varying amounts of time spent in nature and time vacationing in the Veluwe during the past two years.

Factor	None at all	A few times per year	A few times per month	One or more times a week	Total N
About how often have you spent time in nature in the past two years?					
Valid Percent	0.6	25.1	28.7	45.6	
Frequency	(*3*)	(*126*)	(*144*)	(*229*)	502
How often have you gone on a holiday/day trip in the Veluwe in the past two years?					
Valid Percent	19.1	57.1	14.1	9.7	
Frequency	(*95*)	(*284*)	(*70*)	(*48*)	497

Due to differences in individual ideas regarding what constitutes time “in nature,” we asked participants if they typically spent more time out in nature or around the campsite/recreation park while vacationing in nature. Almost half of respondents (48.4%) reported that they spent more time in the campground/around the recreation park. Slightly less (43.9%) reported that they spent more time out in nature, while 7.7% reported that they never vacation in nature.

To determine what the most common outdoor activities participated in were, we asked how often respondents participated in eight different activities in nature during the past two years. The activities and their frequencies are listed in Table 4. The most common activities were walking/jogging/running and biking/mountain biking, while photography and picnicking were the next most common activities. Walking/jogging/running was the only activity where the median response was often.

Table 4. Valid percentage, mean, and standard deviation of eight different outdoor recreational activities participated in by respondents of a survey conducted in the Veluwe region of the Netherlands in July of 2015.

Factor	Never Percent	Sometimes Percent	Often Percent	Daily Percent	Mean	Standard Deviation	N
Jog/Run/Walk	18.9	30.8	39.3	11.0	2.424	0.919	491
Bike/Mountain Bike	29.3	34.7	28.5	7.6	2.144	0.929	499
Photography	38.6	40.6	18.0	2.8	1.851	0.811	495
Camp	52.8	28.0	16.6	2.6	1.690	0.839	500
Watch or study wildlife	51.8	34.9	11.7	1.6	1.631	0.751	496
Picnic	47.4	45.1	7.5	0.0	1.601	0.625	494
Flying kites	83.6	15.0	1.4	0.0	1.178	0.418	494
Horseback riding	89.3	7.8	2.3	0.6	1.142	0.452	486

Wildfire Awareness and Perception

The survey instrument included five questions focusing on how aware individuals were about wildfire activity and their perception toward wildfire. In this section of the survey, we sought to gain insight on personal experience and knowledge about wildfires and the perceived seriousness and likelihood of wildfire occurrence.

When questioned on their experience with wildfires, 89 individuals (17.6%) reported that they had seen one in person (Table 5). Almost half (45.3%) had heard of wildfire occurring in the Netherlands, and 37% had heard of one in another country. Less than six percent of individuals had a close friend or family member who had seen one. Slightly more than one-third of respondents had no experience with wildfires.

Table 5. Valid percentages, frequencies, means, and standard deviations of five different ways a respondent has experience with wildfires. Data collected in the Veluwe region of the Netherlands in July of 2015. N = 506.

Factor	Valid Percent	Frequency	Mean	Standard Deviation
I have heard of a wildfire occurring in the Netherlands.	45.3	229	0.453	0.498
I have heard of a wildfire occurring in another country.	37.0	187	0.370	0.483
I have no experience with wildfires.	36.6	185	0.366	0.482
I have seen a wildfire in person.	17.6	89	0.176	0.381
A close friend or family member has seen a wildfire.	5.5	28	0.055	0.229

When asked how serious of a threat wildfire is to seven different items, the majority (77.1%) of respondents claimed that wildfire was either a moderately or extremely serious threat to people living in the Veluwe and plants and animals. Many respondents listed wildfire as a slightly serious threat to people living in their region, people living in the Netherlands, and homes and structures. The majority (52.4%) of respondents believe that wildfire is not at all serious of a threat to themselves and their families and their local community. Full results are listed in Table 6.

Table 6. Average responses for seven factors ranked from one to four regarding the severity of wildfire impact when asked: “in general, how serious of a threat is wildfire to…”

Factor	Mean	Standard Deviation	Median	Percent Not Serious	N
Plants and animals	3.155	0.932	3	6.9	476
People living in the Veluwe	2.831	0.870	3	6.6	472
Homes and structures	2.388	0.913	2	16.2	474
People living in the Netherlands	2.231	0.880	2	20.0	464
People living in your region	1.938	0.972	2	41.9	468
People living in your community	1.794	0.972	1	50.6	472
You and your family	1.754	0.959	1	52.4	475

Responses coded as 1 = Not at all Serious, 2 = Slightly Serious, 3 = Moderately Serious, 4 = Extremely Serious

In addition to determining how seriously respondents see wildfire as a threat, we also asked how likely they would rate that a wildfire will break out in the Netherlands within the next two years. Only 15.1% reported that it was either very unlikely or unlikely, while 73.8% reported that it was either likely or very likely (Table 7).

Table 7. Perceived likelihood of a wildfire occurring in the Netherlands from respondents to a survey distributed in the Veluwe region of the Netherlands in July of 2015. N = 504.

Perceived Likelihood	Frequency	Valid Percent	Cumulative Percent
Very Unlikely	13	2.6	2.6
Unlikely	63	12.5	15.1
Likely	230	45.6	60.7
Very Likely	142	28.2	88.9
Uncertain	56	11.1	100.0

The survey instrument included one open-ended question asking participants what they can do to help prevent wildfires. The majority (85%) of respondents wrote an answer for this question. The responses were recoded based on the most common responses, which were as follows: (A) no fire/campfire/BBQ, (B) specifically mentioned some form of preventive activity in nature or a specific vegetation type, (C) be careful, cautious, or think logically, (D) no smoking or be cautious with cigarette butts, (E) no trash or glass, (F) some form of prevention or mitigation, and (G) a miscellaneous category. Of these seven responses, a majority of participants (74.3%) mentioned category A (no fire/campfire/BBQ)

(Table 8). Only 9.5% of participants reported some form of prevention or mitigation technique.

Table 8. Recoded responses to an open-ended question asking what the individual can do help prevent wildfires on a survey distributed in the Veluwe region of the Netherlands in July of 2015. N = 440.

Factor	Frequency	Valid Percent
No fire/campfire/BBQ	327	74.3
Nature or specific vegetation type*	195	44.3
Be careful, cautious, or logical	173	39.3
No smoking or be careful with cigarette butts	136	30.9
No trash or glass	83	18.9
Some form of prevention or mitigation	42	9.5

*Mentioned in nature or a specific vegetation type when mentioning one of the other factors.

To determine participant knowledge regarding influences on wildfire behavior, participants were asked how much of an influence five different factors had on wildfire behavior. The five factors were (A) wind speed, (B) temperature, (C) time since last rainfall, (D) humidity, and (E) cloud cover. Wind speed, temperature, and time since last rainfall were all largely perceived as a great influence on wildfire behavior (Table 9). Cloud cover was recognized as the least influential. Most respondents accurately listed the influence of these different factors, which represents good understanding of the climactic factors that influence wildfire.

Table 9. Amount of influence five different factors have on wildfire behavior. Data collected from the Veluwe region of the Netherlands in July of 2015.

Factor	No Influence	Little Influence	Moderate Influence	Great Influence	Mean	Standard Deviation
Wind speed	1.6	2.2	11.4	84.7	3.793	0.552
Temperature	1.0	5.0	19.6	74.4	3.522	0.618
Time since last rainfall	5.2	7.6	17.1	70.1	3.673	0.844
Humidity	6.3	17.7	32.5	43.5	3.133	0.920
Cloud cover	19.4	34.3	32.2	14.1	2.411	0.956

Responses coded as 1 = No Influence, 2 = Little Influence, 3 = Moderate Influence, 4 = Great Influence
Wind speed N = 498, Temperature N = 496, Time since last rainfall N = 485, Humidity N = 480, Cloud cover N = 475

Wildfire Preparedness and Expectations of the Government

The survey instrument also included six questions focusing on preparedness levels of participants and their expectations of their government entities. This section focused on factors such as whom participants expect to provide them with information regarding wildfires, their opinions on nature management, and how prepared they are for wildfires.

Participants chose which out of five different entities they expected to provide them with information regarding wildfires. The five entities were (A) the federal

government, (B) the local government, (C) the police, (D) the fire department, and (E) the media. The majority of participants expect all but the police to provide information on wildfires (Table 10). The media was the most expected (67. 1%) to provide people with information regarding wildfires.

Table 10. Valid percentage, frequency, mean, and standard deviation of respondents' expectation of five different entities to provide them with information regarding wildfires. Data from a survey distributed in the Veluwe region of the Netherlands in July 2015. N = 505.

Factor	Valid Percent	Frequency	Mean	Standard Deviation
The media	67.0	339	0.671	0.470
The local government	64.2	324	0.642	0.480
The federal government	61.0	308	0.610	0.488
The fire department	54.3	274	0.543	0.499
The police	23.8	120	0.238	0.426

Responses coded as not marked = 0, marked = 1

Survey respondents were asked to rank their level of agreement with nine different factors relating to nature management and fire effects on the landscape, the results of which are listed in Table 11. The average level of agreement to each factor is listed in Table 12.

The statement that most respondents agreed with was "all fires, regardless of origin, should be put out as soon as possible," with over three-fourths (76.7%)

agreeing. Individuals also largely agreed that humans accidentally cause most of the wildfires in the Netherlands and that selectively cutting dead and dying trees for safety reasons is better than leaving them in nature (62.9% and 62.2%, respectively). Over 200 individuals (42.4%) disagreed with selectively cutting dead and dying trees for aesthetic purposes; they would rather them be left in nature. One-third of respondents were uncertain if lightening causes most of the wildfires in the Netherlands. Most individuals agree that humans cause most of the wildfires in the Netherlands, with more believing that humans accidentally cause wildfires. Respondents know that lightening does not cause most of the wildfires in the Netherlands. These are accurate beliefs with what is currently known by agencies.

Table 11. Valid percentage of agreement for nine different factors.

Item	Disagree	Neutral	Agree	Uncertain	N
All fires, regardless of origin, should be put out as soon as possible.	7.0	12.8	76.6	3.6	500
Humans accidentally cause most of the wildfires in the Netherlands.	5.8	14.4	62.9	17.0	501
Selectively cutting dead and dying trees for safety reasons is better than leaving them in nature.	15.5	18.5	62.6	3.4	503
Fire risks are so great that managers need to use any means necessary to reduce them.	11.7	29.6	44.3	14.3	503
Fires kill a majority of trees in a burned area in the Netherlands.	18.9	22.7	34.2	24.1	497
Humans intentionally cause most of the wildfires in the Netherlands.	20.0	20.8	28.7	30.5	501
To leave nature alone is preferable to human intervention in ecosystems.	36.3	30.4	31.9	1.4	496
Selectively cutting dead and dying trees for aesthetic purposes is better than leaving them in nature.	42.4	21.2	31.7	4.8	505
Lightening causes most of the wildfires in the Netherlands.	29.9	23.1	13.7	33.3	502

Table 12. Average level of agreement for nine different statements regarding nature management in the Netherlands.

Factor	Mean	Standard Deviation
All fires, regardless of origin, should be put out as soon as possible.	0.72	0.588
Humans accidentally cause most of the wildfires in the Netherlands.	0.68	0.603
Selectively cutting dead and dying trees for safety reasons is better than leaving them in nature.	0.50	0.754
Fire risks are so great that managers need to use any means necessary to reduce them.	0.38	0.710
Fires kill a majority of trees in a burned area in the Netherlands.	0.20	0.811
Humans intentionally cause most of the wildfires in the Netherlands.	0.12	0.824
To leave nature alone is preferable to human intervention in ecosystems.	-0.04	0.832
Selectively cutting dead and dying trees for aesthetic purposes is better than leaving them in nature.	-0.09	0.877
Lightening causes most of the wildfires in the Netherlands.	-0.24	0.774

Responses coded as -1 = Disagree, 0 = Neutral, 1 = Agree

Respondents were also asked to rank their level of agreement with nine different statements regarding preparedness and expectation of government entities. Their responses are listed in detail in Table 13 and average responses are listed in descending order in Table 14.

A large majority (81.4%) believe it is the duty of the government to inform them if a wildfire starts. More than three-fourths (75.8%) also believe it is the duty of the government to educate them on what to do in the event of a wildfire. Approximately one-third (33.1%) of participants believe that they know what they can do to be safe during a wildfire, but only 28.9% believe that they know how to evacuate during a wildfire. Less than seven percent (6.6%) agree that they are prepared for a wildfire in the Veluwe and the average response to the statement “I need to prepare for a wildfire,” was precisely neutral (0.00).

Table 13. Level of agreement with nine different statements regarding preparedness for a wildfire and expectations of government entities reported by respondents to a survey distributed in the Veluwe region of the Netherlands in July of 2015.

Item	Disagree	Neutral	Agree	N
It is the duty of the government to inform me if a wildfire starts.	4.0	14.6	81.4	499
It is the duty of the government to educate me on what to do in a wildfire.	4.8	19.4	75.8	499
I am safe when I follow instructions from emergency personnel.	15.3	42.2	42.4	502
I need to prepare for a wildfire.	26.3	47.0	26.7	498
I know what I can expect from an emergency agency.	35.1	33.1	31.7	501
I know what I can do to be safe during a wildfire.	39.1	27.8	33.1	496
I know how to evacuate during a wildfire.	43.7	27.3	28.9	494
I know what I can do to protect my property during a wildfire.	43.5	33.2	23.3	497
I am prepared for a wildfire in the Veluwe.	55.5	38.0	6.6	503

Table 14. Level of agreement with nine different factors relating to wildfire preparedness.

Factor	Mean	Standard Deviation
It is the duty of the government to inform me if a wildfire starts.	0.78	0.499
It is the duty of the government to educate me on what to do in a wildfire.	0.72	0.535
I am safe when I follow instructions from emergency personnel.	0.27	0.709
I need to prepare for a wildfire.	0.00	0.731
I know what I can expect from an emergency agency.	-0.02	0.812
I know what I can do to be safe during a wildfire.	-0.05	0.848
I know how to evacuate during a wildfire.	-0.14	0.841
I know what I can do to protect my property during a wildfire.	-0.19	0.793
I am prepared for a wildfire in the Veluwe.	-0.48	0.613

Responses coded as -1 = Disagree, 0 = Neutral, 1 = Agree

Most respondents (81.3%) said that they have not searched for information about what to do during a wildfire, only 12.9% of respondents have searched for information on what to do during the event of a wildfire, with 5.8% uncertain. When asked if they pay more attention to potential arsonists when the wildfire risk is higher, almost half (47.9%) responded yes, while over one-third (34.1%) responded no, with 18% uncertain.

The Netherlands has a color-coded wildfire thermometer that ranks wildfire danger with five different colors. Only 85 individuals (17%) reported being aware of the color-coded wildfire thermometer. As discussed previously, issues regarding questions 19 and 20 resulted in them being removed from statistical analysis. However, due to the confusion even among individuals who reported being aware of the wildfire thermometer, it can be safely assumed that the majority of visitors and residents to the Veluwe have not been adequately informed of the system.

Crosstabular Analysis

To determine relationships between multiple variables, crosstabular analyses were performed. Responses to all questions were compared with several factors, including gender, age group, language of distributor, location type, upbringing (rural or urban), and if the respondent was a visitor or a resident of the Veluwe.

The language spoken by the distributor and rural or urban upbringing had no measures of association with an absolute value greater than weak (0.001 to 0.199). Upbringing type also had no strong relationships, which is consistent with findings elsewhere.

There is a moderate relationship (Cramer's V = 0.321; $p < 0.0005$) between being a resident of the Veluwe and respondent's age group. The oldest age group (62 and over) had over twice as many residents to the Veluwe than the youngest age group (18 to 35). There is also a relationship (strong Cramer's V = 0.438; $p < 0.0005$) between age group and location type. Older residents were more likely to be in the villages and campgrounds while recreation parks had mostly younger visitors. Similarly, there is also a relationship (very strong Cramer's V = 0.796; $p < 0.0005$) between location type and being a resident of the Veluwe. Given that we distributed in villages during typical business hours (8 am to 5 pm), older individuals of retirement age were more likely to be home. Individuals at the campgrounds and attraction parks were more likely to be on a holiday or day trip to the Veluwe.

Respondents in the two older age groups (46 to 61 and 62 and over) spent more time in nature than the two younger age groups (18 to 35 and 36 to 46). Acknowledging that older residents are more likely to be residents in the Veluwe, they are in an area more embedded within nature than many other areas of the

country. These individuals might consider sitting out in their garden as spending time in nature.

Table 15. Crosstabular analysis between age group and frequency of time spent in nature during the past two years.

		Age Group				
		18-35	**36-46**	**46-61**	**62+**	**Total**
None at all	Count	1	2	0	0	3
	Percent within Age Group	0.8%	1.6%	0.0%	0.0%	0.6%
A few times per year	Count	48	33	28	17	126
	Percent within Age Group	39.7%	26.6%	22.4%	13.3%	25.3%
A few times per month	Count	40	41	28	32	141
	Percent within Age Group	33.1%	33.1%	22.4%	25.0%	28.3%
One or more times a week	Count	32	48	69	79	228
	Percent within Age Group	26.4%	38.7%	55.2%	61.7%	45.8%
Total	Count	121	124	125	128	498
	Percent of Total	24.3%	24.9%	25.1%	25.7%	100.0%

The older two age groups were more likely to believe that wildfire is moderately or extremely serious of a threat to themselves and their families

(moderate, positive Kendall's tau-b = 0.210; $p < 0.0005$). The older an individual was also affected their opinion on the seriousness of wildfire to their local community (moderate, positive Kendall's tau-b = 0.208; $p < 0.0005$). Individuals in the attraction parks are likely to not consider wildfire a serious threat to themselves and their families (moderate Cramer's V = 0.267; $p < 0.001$) or to people living in their region (moderate Cramer's V = 0.228; $p < 0.0005$).

Age group and gender were weakly related, but the distribution of these two factors exhibited opposite trends. There were more females in the younger age groups and more males in the older age groups (Table 16).

Table 16. Crosstabular analysis between age group and gender.

		Age Group				
		18-35	**36-46**	**46-61**	**62+**	**Total**
Male	Count	45	56	61	77	239
	Percent within Age Group	36.9%	45.2%	48.8%	58.8%	47.6%
Female	Count	77	68	64	54	263
	Percent within Age Group	63.1%	54.8%	51.2%	41.2%	52.4%
Total	Count	122	124	125	131	502
	Percent of Total	24.3%	24.7%	24.9%	26.1%	100.0%

There is a relationship between time spent in nature and location type surveyed (moderate Cramer's V = 0.302; $p < 0.0005$). Village residents were most likely to spent time in nature one or more times per week (42.4%). These villages are embedded within nature. Village residents also spend more time out in nature when vacationing in nature instead of spending time around the campground/recreation park. Park visitors spend more time around the campground or recreation park and campground visitors spend more time around the campground/recreation park than out in nature. The relationship between these two variables is moderate (Cramer's V = 0.314; $p < 0.0005$).

Women were more likely (moderate Cramer's V = 0.216; $p < 0.0005$) to self-identify as lacking knowledge in how to evacuate during a wildfire than men. Similarly, men also were more likely (moderate Cramer's V = 0.233; $p < 0.0005$) to agree that they know what they can do to be safe during a wildfire.

Additional cross-tabular analyses were conducted on the eighty-nine individuals who responded that they have seen a wildfire in person. These individuals are more likely to watch and study wildlife (moderate Cramer's V = 0.238; $p < 0.0005$). They were also almost twice as likely (24.3% to 46.6%) to rate the likelihood that a wildfire will occur in the Netherlands within the next two years as "very likely" (moderate Cramer's V = 0.237; $p < 0.0005$).

Those who have previously searched for information on what to do during a wildfire were moderately more likely to have higher preparedness levels. Individuals who have searched for information on what to do during a wildfire were twice as likely to agree that they know how to evacuate during a wildfire (24.9% to 58.7%; moderate Cramer's V = 0.217; $p < 0.0005$). They were also more likely to agree that they know what they can do to protect their property during a wildfire (18.8% to 51.6%; moderate Cramer's V = 0.216; $p < 0.0005$) and agree that they know what they can do to be safe during a wildfire (28.4% to 62.5%; moderate Cramer's V = 0.208; $p < 0.0005$). These individuals were over three times (13.5% to 45.3%) more likely to have heard of the wildfire thermometer (moderate Cramer's V = 0.295; $p < 0.0005$).

Respondents are more likely to agree that they are prepared for a wildfire in the Veluwe if they have received information on wildfire prevention (moderate Cramer's V = 0.242; $p < 0.0005$). There is a moderate relationship (moderate, positive Kendall's tau-b = 0.219; $p < 0.0005$) between those who believe that fire risks are so great that managers need to use any means necessary to reduce them and those that identify as needing to prepare for a wildfire.

There are eighty-nine individuals that participate in some outdoor recreational activity daily. These individuals are more likely to rate a wildfire as a serious

threat to themselves and their families (moderate Cramer's V = 0.201; $p < 0.0005$) and their local communities (moderate Cramer's V = 0.239; $p < 0.0005$).

DISCUSSION

Although wildfires have not traditionally occurred frequently in the Netherlands, adaptions should be made to recognize the role of fire on the landscape and within Dutch society. The most thoroughly researched practices in dealing with wildfire will mean little unless the public is on board. The overall purpose of this study was to answer a question that had received little attention beforehand: how do Dutch visitors and residents of the Veluwe think about wildfire? No previous research exists on this specific topic, which prompted this study to focus on the human dimensions of wildfire rather than ecology. Given the amount of time spent in nature, time spent in the Veluwe, and the frequency of outdoor recreational activities, most visitors and residents to the Veluwe are frequently at risk from wildfire activity. To discuss the results, we return to the objectives set for this project.

Determine the level of understanding visitors and residents to the Veluwe have about wildfire.

Visitors and residents to the Veluwe have a much better understanding of wildfire dynamics than anticipated. Respondents understood that wind speed and temperature exhibit great influence over wildfire behavior. Respondents also believe that time since the last rainfall exhibits great influence, but it is important for Dutch fire managers to convey that moisture levels in the

vegetation is more important than time since last rainfall. There is also more awareness toward wildfire frequency in the Netherlands than anticipated. The majority of respondents were aware that a wildfire will likely occur in the Netherlands within the next two years. This puts managers one step ahead – they will not have to focus efforts on informing people that wildfires have occurred and will continue to occur. Instead, managers can stress preparedness. Many individuals believe that wildfire is a threat to plants and animals, but not to their own homes or communities. The communities we surveyed would certainly be considered wildland-urban interface, with many homes surrounded by dense vegetation. Those living within these communities need to be aware that they are living with an interface.

Identify and quantify public opinions toward wildland fire

The Netherlands is a part of the Western world, which often views natural resources as useful tools for humans. Most people recognize that fire is a threat to the natural world and to others living in certain areas, but tend to minimize the threat wildfire has on them personally. Respondents believe that plants, animals, homes, and structures are more susceptible to wildfire behavior than people. Most individuals recognized that wildfire is a threat to those living within the Veluwe, but not to themselves or their communities, even if they live within the Veluwe. The “it could never happen to me” attitude is common, but should be addressed before the idea becomes too engrained. Relatively few individuals

have taken measures to proactively search out information on what to do during a wildfire. This reflects the perception that while wildfire may damage “others” as well as plants and wildlife, it poses little threat to the individual.

Identify and quantify public expectations of government agencies in the event of a wildland fire

Most individuals expect the federal and local governments, the fire department, and the media to provide them with information regarding wildfires. Most individuals also believe that if they follow instructions from emergency personnel. It is the duties of the government to not only inform citizens if a wildfire starts, but also to educate citizens on what to do in the event of a wildfire. The Dutch trust their government and expect quality education efforts. Very few individuals have received information on wildfire prevention, which is representative of (1) how uncommon wildfires historically have been in the Netherlands and (2) a lack of information to give.

Determine if there are significant differences in opinions between different types of recreationists and local residents

Villagers and campers tend to take wildfire more seriously than those visiting attraction parks. Older citizens are also more likely to take wildfire seriously, but also might underestimate their ability to mitigate fire risks.

RECOMMENDATIONS

When the rest of the world needs advice on coastal engineering, they look to the Netherlands. Luckily for the Dutch, many other countries have been tackling their wildfire issue for decades. The Dutch will be able to take the best, most effective ideas from other countries and implement them in a way that works best in their nation.

In most municipalities in the Netherlands, landowners must purchase a permit to remove trees from their property. This could prevent homeowners from mitigating wildfire risk on their property. Individuals should be allowed to cut trees on their property free of permits if they confirm it is to make their homes safer from wildfires. I would also recommend discussing with home insurance companies if they could offer a potential incentive if individuals properly protect their homes from wildfire

The wildfire thermometer is not well-known and hardly utilized. The wildfire thermometer should become much more well-known and well understood. I would recommend signage at government buildings and entrances to parks indicating the wildfire color for that day. Until the wildfire thermometer becomes

more well known, I also recommend a one-page flyer or pamphlet be handed out to visitors as they enter a park or check in at a campground. These materials should also include recommended behavior with each color. The thermometer contains an easily recognizable gradient of colors (green to red), but there are no clear instructions on necessary changes of behavior as the fire danger risk increases. A public service announcement broadcasted through various news outlets is also recommended. A review of literature shows that people typically do not see the risks to themselves as severe as those faced by others (Weinstein, 1999). In Australia, it was found that the majority of people found the Fire Danger Rating system to be more appropriate for visitors and those unfamiliar with the area, whereas locals felt as though they did not need to heed warnings as much (Reid & Beilin, 2014). Along with efforts to increase awareness and utilization of the wildfire thermometer, it should be stressed that all individuals should take the warnings into consideration – not just visitors.

In some areas around and in campgrounds and other sensitive areas, owners, visitors, and residents have noted the lack of fire hydrants. Fire hydrants should be placed where appropriate.

I encourage researching the use of prescribed burning and mechanical vegetation removal in appropriate areas to mitigate wildfire severity. It cannot currently be stated whether or not these practices would be appropriate in

different Dutch ecosystems, but further research should be conducted. It is important to note that prescribed burning and mechanical vegetation removal are not two interchangeable practices. Fire of any kind on the landscape changes the chemical composition of materials and is essentially expedited decomposition. Removing vegetation entirely from the landscape removes those chemical components as well. Further research will indicate where and when prescribed burning in the Veluwe is appropriate. Protecting and maintaining high levels of biodiversity is not necessarily compromised with prescribed burning, but that hugely depends on the ecosystems involved, the timing of prescribed burns, and the length of time in which biodiversity is measured. In Australia, biodiversity is also highly prioritized. A textual analysis of submission to Victorian Parliament regarding wildfires found that 28% of individuals argued for less or no prescribed burning, claiming it could lead to a loss of biodiversity. Proper research and an ecological knowledge of the landscape will illuminate situations in which prescribed burning and biodiversity can both be achieved.

In the United States, suppression tactics can potentially lead to increased large wildfire activity (Calkin, 2015). There is not enough existing research to suggest that this is the case throughout the entirety of the Netherlands, but such research should be conducted. The United States completely changed our fuel dynamics by keeping fire off of the landscape for decades, to a large detriment. Caution should be taken to avoid those same mistakes. If Dutch nature

managers decide to explore options other than suppression, it is vital to communicate with affected communities before an event occurs (Steelman & McCaffrey, 2012).

Engaging local communities is important for taking positive steps toward wildfire. Community, however, is an ambiguous term with many varied definitions. Community is categorized by a reference to locality, a sense of belonging, and a social network (Fairbrother et al., 2012). Once communities are established, there are several factors that lead to successful, productive wildfire adaption groups. In Australia, particularly in the fire-heavy state of Victoria, small local groups called the Community Fireguards (CFG) help residents collaborate with others and gain more control over their wildfire safety. CFGs work together with the Country Fire Authority to pair fire safety specialists with small communities. Those participating in their local CFG learn about fire safety through programs, training sessions, and meetings – most held in homes in the neighborhood. CFGs benefit the community in many ways. Participants gain technical knowledge, but more importantly, gain a sense of community and friendship. In Victoria, Australia, Sharp (2013) determined that proper communication is one of the most important factors in positive community-agency relations before, during, and after a wildfire. This study also found that when community members were able to provide input in decision-making before

a wildfire, they were also willing to leave decision-making to the experts during a wildfire.

Everett and Fuller (2011) studied Fire Safe Councils (FSCs) in California. FSCs, similar in nature to the Community Fireguards in Australia, are community-based groups that work to reduce wildfire hazard. In the 2011 study, almost all of 28 FSCs surveyed had completed a Community Wildfire Protection Plan or would be doing so in the near future. FSCs set broad guidelines on how to start a council, but have no set criteria. Community members are allowed to utilize the council in the best way they see fit and conduct fire hazard reduction activities. Many of these councils have individuals from the federal government, the state government, non-governmental organizations (NGO), volunteer fire departments, private landowners, and environmental organizations. The variety of members ensures that decisions made are well-rounded with scientific backing. I recommend that Dutch fire agencies establish small community groups that aim to reduce wildfire risk, starting with small villages heavily embedded within the forests. These could potentially be labeled as “fire boards” to compare to the existent water boards.

Once a local fire group is established, Stidham et al. (2014) stresses the importance of neighborhood cooperation, good leadership, and hardworking residents. These factors were often quoted as core reasons why communities

were successful in protecting themselves from wildfires. Communities have more adaptive capacity when the following three factors are incorporated: networks and relationships among locals, local knowledge and experience, and expert knowledge and experience. Small scale-social processes and interactions strongly influence mitigation decision-making (Brenkhert-Smith, 2010).

As previous mentioned in the Steelman and McCaffrey article, one of the most important aspects of effective communication is to communicate before and during a crisis to leverage established relationships. Once relationships are established with local communities, it is imperative to communicate with potentially affected communities before an event occurs. Just as a large wildfire starts as a small flame, tackling the wildfire problem begins small. Communities must be engaged and encouraged to actively mitigate fire risk, and must be taught how to do so by government entities. The Dutch trust their government; it is the government's job to meet these standards of trust and give these communities the best possible information and opportunities.

CONCLUSIONS

Many varied groups and agencies in the Netherlands have made a concerted effort to address the growing wildfire issue in their country. They have advanced response systems and firefighting equipment in place, but the public needs a larger role in decision-making regarding fire in their communities.

Educational programs and materials should have different tactics when addressing different groups. For example, visitors and residents do not need the exact same information regarding wildfires. Likewise, older individuals and younger individuals each need detailed, specific information directed toward them.

One of the most important conclusions is how few people self-identify as being prepared for a wildfire in the Veluwe. This is not terribly surprising, given how recently fire has become an issue on the landscape. Interestingly, more people have the perception that they know how to evacuate safely and keep their property safe, but the truth behind these statements need to be further researched.

Due to such high expectations of government and media, it will be important for managers to meet those expectations. The Dutch have such high trust levels in their government, so that can be utilized as an advantage. In the Veluwe, most

people are aware that wildfires do occur and will happen again, so outreach efforts should focus on preparedness and evacuation

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APPENDICES

APPENDIX A

Wildland Fire Study: A Nationwide Survey of Citizens; Revised Schindler Survey from Dr. Sarah McCaffrey

Wildland Fire Study: A Nationwide Survey of Citizens

1. Prior to this survey, how much had you thought about wildfires in Nature?

A moderate amount

|

a great deal 1----------2----------3----------4----------5 none

- **National**
- **Different regions**

2. About how far is it from your home to a natural area where a wildfire might burn?

3. About how often do you spend time in a natural area?

	daily	several times a week	about once a week	about once a month	a few times a year	less than once a year	never
▸ national							
▸ AZ							
▸ UT							
▸ OR							
▸ CO							
▸ GA							
▸ FL							

4. In your opinion, how would you rate the likelihood that a wildfire could break out in nature in the next five years?

Very likely	Somewhat likely	Somewhat unlikely	Very unlikely	Don't know

5. **Public trust** in agencies is essential to the success of fire protection programs. Please indicate your level of trust in these agencies to make good decisions

about wildfires and fire prevention. If you feel you have no basis for judgment, please mark “no opinion.” We will need to change the agencies

6.

		national	AZ	UT	OR	CO	GA	FL	MN	WI	MI
City Government	moderate/full										
	none/limited										
	no opinion										
County Government	moderate/full										
	none/limited										
	no opinion										
State Government	moderate/full										
	none/limited										
	no opinion										
Others	moderate/full										
	none/limited										
	no opinion										

7. We're interested in learning more about what residents of your area **know about wildfires**. Please answer the following questions to the best of your ability by indicating whether you believe the answer is generally true, generally false, or that you are not sure.

		national	**others**
Humans cause most of the wildfires in your state (U.S.).	generally true		
	generally false		
	not sure		
Fires kill a majority of animals in a burned area.	generally true		
	generally false		
	not sure		
Fires kill a majority of large trees in a burned area.	generally true		
	generally false		
	not sure		
The quality of water in streams and rivers is often badly degraded in the first year or two after a wildfire.	generally true		
	generally false		
	not sure		
Many plants require occasional fires so that new seeds or seedlings can sprout.	generally true		
	generally false		
	not sure		
Fires play an important role in controlling noxious weeds in your state's forests and rangelands.	generally true		
	generally false		
	not sure		
Fires play an important role in controlling insect and disease outbreaks in forests and rangelands.	generally true		
	generally false		
	not sure		

The next few questions ask for your opinions about specific practices that resource managers can use to change environmental conditions in forests and rangelands. Please read the following descriptions, then answer the questions about management practices.

- **Prescribed fire** – Also called controlled burning, this practice can involve 1) letting a naturally caused fire burn under close and careful watch; or 2) intentionally setting fires in ways that can be controlled to produce desired conditions and protect against undesired results.
- **Mechanical vegetation control** – Managers can use chainsaws, mowers, or other specialized machines to reduce the number of shrubs and small trees where they are so numerous that they increase the risk and size of wildfires.
- **Grazing** – In some cases, domestic animals can be placed in areas where they graze on plants before they dry out in summer, thus reducing the amount of flammable vegetation later on.
- **Restoration planting** – Planting native, fire-adapted, or less flammable species that can slow the spread of wildfires.
- **Thinning –** In some cases, high-risk areas with numerous trees, the trees are too big for mowing machines but can be thinned out using chain saws or other harvesting equipment.

8. In my opinion, intentionally setting **prescribed fires** in nature is:

	national	**Others**
▸ a legitimate tool that resource managers should be able to use whenever they see fit.		
▸ something that should be done only infrequently, in carefully selected areas.		
▸ a practice that should not be considered because it creates too many negative impacts.		
▸ an unnecessary practice.		
▸ I know too little to make a judgment about this topic.		

9. In my opinion, **mechanical vegetation removal** in nature is:

		national
▸ a legitimate tool that resource managers should be able to use whenever they see fit.		
▸ something that should be done only infrequently, in carefully selected areas.		
▸ a practice that should not be considered because it creates too many negative impacts.		
▸ an unnecessary practice.		
▸ I know too little to make a judgment about this topic.		

10. In my opinion, **grazing** in nature is:

	national	
▸ a legitimate tool that resource managers should be able to use whenever they see fit.		
▸ something that should be done only infrequently, in carefully selected areas.		
▸ a practice that should not be considered because it creates too many negative impacts.		
▸ an unnecessary practice.		
▸ I know too little to make a judgment about this topic.		

11. In my opinion, **restoration planting** to prevent wildfires in nature is:

	national	
▸ a legitimate tool that resource managers should be able to use whenever they see fit.		
▸ something that should be done only infrequently, in carefully selected areas.		
▸ a practice that should not be considered because it creates too many negative impacts.		
▸ an unnecessary practice.		
▸ I know too little to make a judgment about this topic.		

12. Not everyone agrees about the **impacts and effectiveness of fuels management practices**. We'd like to know what *you* believe about the practices described on the previous page. For each of the following statements, please circle the number that best reflects your belief about the accuracy of the statement. You are not being judged on right or wrong answers – we are interested in your opinion. If you feel you do not know enough to give an opinion, please circle "don't know" for that statement.

Prescribed fire has little overall effect on the intensity or frequency of wildfires.	agree disagree don't know	
Prescribed fire effectively reduces amounts of fuel in most forest and rangelands.	agree disagree don't know	
Prescribed fire stimulates the growth of native plants eaten by wildlife.	agree disagree don't know	
Prescribed fire reduces the amount of useful minerals in the soil.	agree disagree don't know	

Mechanical vegetation removal is an effective way to reduce the intensity and frequency of wildfires.	agree disagree don't know	
Mechanical vegetation removal often leaves behind unacceptable amounts of fuel in natural areas.	agree disagree don't know	
Mechanical vegetation removal stimulates the growth of native plants eaten by wildlife.	agree disagree don't know	
Livestock grazing has little overall effect on the intensity or frequency of wildfires.	agree disagree don't know	
Livestock grazing stimulates the growth of native plants used by wildlife.	agree disagree don't know	
Restoration planting is an effective way to reduce the intensity and frequency of wildfires.	agree disagree don't know	
Restoration planting cannot re-create a natural area, only create a different kind of artificial one.	agree disagree don't know	

13. To further help natural resource managers make decisions, please tell us how you feel about the following by circling the number that best matches your agreement with each statement.

		national	
Following nature's way is preferable to human intervention in ecosystems.	agree disagree uncertain		
All fires, regardless of origin, should be put out as soon as possible.	agree disagree uncertain		
Selectively thinning dead and dying trees is better than leaving them in the forest.	agree disagree uncertain		
Fire risks are so great in your state that managers need to use any means necessary to reduce them.	agree disagree uncertain		

14. We'd like to know what you think about the **scenic impact** of these practices. For each practice, please circle the number that best describes how acceptable you believe the likely impacts are.

▸ prescribed fire	acceptable unacceptable neutral	
▸ mechanical vegetation removal	acceptable unacceptable neutral	
▸ livestock grazing	acceptable unacceptable neutral	
▸ restoration planting	acceptable unacceptable neutral	

15. The use of prescribed fire may create concerns for some people. Please indicate how concerned you are about the following possible effects in your area.

	concern	
▸ damage to private property	moderate/great	
	none/slight	
▸ effects on recreation opportunities	moderate/great	
	none/slight	
▸ loss of wildlife and fish habitat	moderate/great	
	none/slight	
▸ risk to human safety	moderate/great	
	none/slight	
▸ economic loss of useable timber	moderate/great	
	none/slight	
▸ reduced scenic quality	moderate/great	
	none/slight	
▸ increased levels of smoke	moderate/great	
	none/slight	
▸ deteriorated public water supply	moderate/great	
	none/slight	
▸ increased soil erosion	moderate/great	
	none/slight	

16. How much confidence do you have in agencies to use the following practices as part of a responsible and effective fuels management program for your county?

▸ prescribed fire	moderate/full none/limited no opinion	
▸ mechanical vegetation removal	moderate/full none/limited no opinion	
▸ livestock grazing	moderate/full none/limited no opinion	
▸ restoration planting	moderate/full none/limited no opinion	

17. Often natural resource managers must decide how to make **tradeoffs** between different approaches or goals. For each of the five pairs of statements below, please tell us what you would prefer managers to do by circling the number that

best reflects your beliefs about the choice between the statement in Column A and the statement in Column B. If you truly feel you do not know enough to give an opinion, circle “don’t know.”

	Column A		**Column B**	
	Prescribed fire should be the preferred option when reducing wildland fuels.	*Neutral*	Mechanical removal should be the preferred option when reducing wildland fuels.	*Don’t know*
	Use prescribed fire in both wild *and* populated areas to reduce wildfire danger.	*Neutral*	Do not attempt to use prescribed fire in populated areas even if it means a higher risk of wildfires.	*Don’t know*
	Use fuels reduction practices in highly scenic areas even if doing so temporarily hurts scenic beauty.	*Neutral*	Do not use fuels reduction practices in highly scenic locations.	*Don’t know*
	Allow livestock grazing wherever it is likely to reduce fuel levels.	*Neutral*	Prohibit livestock grazing in recreation areas even when it can be used to reduce fuel levels.	*Don’t know*
	Try to restore native plants wherever they can be useful for reducing wildfire risks.	*Neutral*	Restore native plants only when doing so won’t reduce an area’s value for recreation or livestock.	*Don’t know*
	Use livestock grazing to remove “fine fuels” such as dead grass in areas where people live close to wildlands.	*Neutral*	Use prescribed fire to remove “fine fuels” such as dead grass in areas where people live close to wildlands.	*Don’t know*

APPENDIX B

A Questionnaire of Self-Reliance in Wildfires in the Dwingelderveld for Visitors

Questionnaire self-reliance in wildfires Dwingelerveld for visitors.

general

1) What is the gender of the respondent? O Male O Female

2) What is your age?

.... Years

3) What is the reason for your visit to the Dwingelderveld

Oh I'm on a camping or near the Dwingelderveld

Oh I walk there

Oh I cycle there

O other

namelijk……

4) How often do you visit the Dwingelderveld?

Oh this is the first time

O once a year

O several times a year

O monthly

O weekly

O day

information

5) Have you received information during your stay at the Dwingelerveld overlooked,:

[tick as appropriate]

O the risks of wildfires in the Dwingelderveld

O what to do when a wildfire on the Dwingelderveld

Oh where to start when a wildfire on the Dwingelderveld

O what not to do when a wildfire on the Dwingelderveld

6) Who you got this information?

[only if answered in the affirmative to the previous question one of the possibilities]

……

knowledge

7) What do you think created the most wildfires?

[reply not list]

O arson

O cigarette

O barbecue

O lightning

O lensing (glass bottle)

O sparks of frictional contact between train wheels and rails

O natural causes

O other

namelijk……

8) In what time of year you estimate the probability of a wildfire is greatest?

[reply not list]

O early spring (March / April)

O spring May / June

O early summer June / July

O Summer August / September

O fall in September / October / November

O winter Dec / January / February

Fire prevention

9) The following questions are about the prevention of wildfires on the Dwingelderveld.

• What do you expect regularly to prevent? Fire on the Dwingelderveld is

……

……..……

• What do you think what you can do to prevent fire in the Dwingelderveld?

……

……..……

• What do you need to prevent a fire in the Dwingelderveld?

……

……..……

Limiting fire

10) The following questions are about limiting wildfires on the Dwingelderveld. You have to imagine that there is an incipient fire on the Dwingelderveld is.

• What do you expect that settled on the Dwingelderveld is to reduce the fire?

……

……..……

• What do you think you can do to reduce this fire on Dwingelerveld?

……

……..……

Increased risk of fire

11) How would you prepare if you have heard that there is an increased risk of wildfire in the area where you are standing to it or want? Is

……

……..……

• What information do you need?

……

……..……

Knowing what to do in case of fire

12) The following questions are about knowing what to do with a larger fire on the Dwingelderveld.

• What do you expect different's Organisations (police, fire, ambulance and municipal) do when a bigger fire on the Dwingelderveld?

……

……..……

• What do you think you can do yourself with a larger fire on the Dwingelderveld?

……

……..……

• What do you need?

……

……..……

priority

13) This question is about setting priorities at a wildfire.

Put in chronological order what you would do first and the last.

[numbering 1 / m 5]

..... Others to safety

..... My belongings secure

..... The emergency call

..... To add to the fire to extinguish.

..... Bring myself to safety

14) Suppose there is a greater fire on the Dwingelderveld, how would you like about this wildfire? Be informed

O sms

O broadcasting

O siren

O other

namelijk……

15) What information should include such a message?

……

……..……

experience

16) Have you ever experienced a wildfire yourself?

Oh no, on to next question

Oh yes

• Was it clear to you what you should do? Or could

……

……..……

• What actions have you taken?

……

……..……

• (if applicable) How was the collaboration with different organizations (police, fire, ambulance and city)?

……

……..……

opinions

17) To what extent do you agree with the following statements?

You can reply with the following response categories: strongly agree, agree, neutral, disagree, strongly disagree, no answer

[1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree, 6 = no answer]

... .. I am prepared for a wildfire on the Dwingelderveld.

... .. I have ever searched for information on what I should do when a wildfire

... .. I need to prepare for a wildfire any help.

... .. I know what I can do during a wildfire in the Dwingelderveld.

... .. I know what I can expect from the emergency

... .. It is the task of the government to inform me about wildfires.

... .. I expect that I can save myself during a wildfire in the Dwingelderveld.

... .. I expect that I can help others during a wildfire in the Dwingelderveld.

... .. When I walk, I follow no danger. The instructions of the emergency

end

This is the end of the questionnaire. Thank you for your cooperation. Do you have any comments or suggestions?

APPENDIX C

A Survey of Citizens about Nature: Final English Version

A Survey about Nature

We are surveying Veluwe visitors and residents to learn about opinions and perceptions toward wildfire. We are asking you to participate in this brief anonymous and voluntary survey. Your answers are greatly appreciated and will help us in developing educational materials concerning wildfire.

1. What is your relationship with the Veluwe? (Mark all that apply)

   ☐I live here. ☐I own a business here. ☐I am on holiday/day trip here.

2. Which best describes the community in which you grew up? (Mark one)

   ☐Rural ☐Urban

3. About how often have you spent time in nature the past two years? (Mark one)

   ☐None at all ☐A few times per year ☐A few times per month ☐One or more times a week

4. How often have you gone on a holiday/day trip in the Veluwe in the past two years? (Mark one)

   ☐None at all ☐A few times per year ☐A few times per month ☐One or more times a week

5. Did you vacation in nature *in the last two years*? Did you receive information about wildfire prevention? (Please circle one for both A and B)

A

Holiday Location in Nature?	
No	Yes

B

Received Information about Wildfire Prevention?	
No	Yes

6. When on a vacation in nature, do you usually spend more time around the campground/recreation park or out in nature? (Mark one)

☐Campground/Recreation Park ☐Out in nature ☐ I never vacation in nature

7. *In the past two years*, how often have you participated in each of the following recreational activities in nature? (Please circle only one number in each row)

	Never	Sometimes	Often	Daily
Bike/Mountain Bike	1	2	3	4
Camp	1	2	3	4
Flying kites	1	2	3	4
Horseback riding	1	2	3	4
Jog/Run/Walk	1	2	3	4
Photography	1	2	3	4
Picnic	1	2	3	4
Watch or study wildlife	1	2	3	4
Other:_____ _	1	2	3	4

8. What has been your experience with wildfires? (Please check all that apply)

☐I have seen one in person. ☐A close friend or family member has seen one. ☐I have heard of one in the Netherlands. ☐I have heard of one in another country. ☐I have no experience with wildfires.

9. In general, how serious of a threat is wildfire to… (Please circle only one number in each row)

	Not at all Serious	Slightly Serious	Moderately Serious	Extremely Serious
…you and your family?	1	2	3	4
…your local community?	1	2	3	4

... people living in your region?	1	2	3	4
... people living in the Veluwe?	1	2	3	4
…people living in the Netherlands?	1	2	3	4
…plants and animals?	1	2	3	4
…homes and structures?	1	2	3	4

10. How would you rate the likelihood that a wildfire will break out in the Netherlands within the next two years? (Mark one)

☐Very Unlikely ☐Unlikely ☐Likely ☐Very Likely ☐ Uncertain

11. What can you do to help prevent wildfires?
_____
_____
_____
_____

12. How much of an influence do the following factors have on wildfire behavior? (Please circle only one number in each row)

	No Influence	Little Influence	Moderate Influence	Great Influence
Temperature	1	2	3	4
Humidity	1	2	3	4
Time since last rainfall	1	2	3	4
Cloud cover	1	2	3	4
Wind speed	1	2	3	4

13. Who do you expect to provide you with information on wildfires? (Please check all that apply)

☐The federal government ☐The local government ☐The police ☐The fire department ☐The media

14. To what extent do you agree or disagree with each of the following statements? (Please circle only one number in each row)

	Disagree	Neutral	Agree	Uncertain
To leave nature alone is preferable to human intervention in ecosystems.	1	2	3	4
Selectively cutting dead and dying trees for safety reasons is better than leaving them in nature.	1	2	3	4
All fires, regardless of origin, should be put out as soon as possible.	1	2	3	4
Lightening causes most of the wildfires in the Netherlands.	1	2	3	4
Fires kill a majority of trees in a burned area in the Netherlands.	1	2	3	4
Humans accidentally cause most of the wildfires in the Netherlands.	1	2	3	4
Selectively cutting dead and dying trees for aesthetic purposes is better than leaving them in nature.	1	2	3	4
Humans intentionally cause most of the wildfires in the Netherlands.	1	2	3	4
Fire risks are so great that managers need to use any means necessary to reduce them.	1	2	3	4

15. To what extent do you agree or disagree with each of the following statements? (Please circle only one number in each row)

	Disagree	Neutral	Agree
I am prepared for a fire in the Veluwe.	1	2	3
I need to prepare for a wildfire.	1	2	3
I know how to evacuate during a wildfire.	1	2	3
I know what I can do to protect my property during a wildfire.	1	2	3
I know what I can do to be safe during a wildfire.	1	2	3
I know what I can expect from an emergency agency.	1	2	3
It is the duty of the government to inform me if a wildfire starts.	1	2	3
It is the duty of the government to educate me on what to do in a wildfire.	1	2	3
I am safe when I follow instructions from emergency personnel.	1	2	3

16. Have you ever searched for information about what you should do during a wildfire? (Mark one)

☐No ☐Yes ☐Uncertain

17. Do you pay more attention to potential arsonists when wildfire risk is higher? (Mark one)

☐No ☐Yes ☐Uncertain

18. Are you aware of the color-coded wildfire thermometer (Kleurcodes Natuurbrandthermometer) that can be found at www.natuurbandgevaar.nl? (Mark one)

☐No ☐Yes

If yes, please answer the following questions. *If no*, please continue to question 21.

19. When conditions seem more dangerous, how frequently do you visit the wildfire thermometer to check for changes in the color? (Mark one)

☐ Never	☐A few times per year	☐A few times per month	☐One or more times a week	☐I am subscribed to the automatic message service

20. How likely would you be to change your plans to visit an area if that area's wildfire thermometer color were… (Please circle only one number in each row)

	Very Unlikely	Unlikely	Likely	Very Likely
…green?	1	2	3	4
…light green?	1	2	3	4
…yellow?	1	2	3	4
…orange?	1	2	3	4
…red?	1	2	3	4

21. What is your gender?

☐Male ☐Female

22. What is your age? _____ years

23. What country are you living in currently? _____

24. What is the postal code from where you live currently? _____

Thank you for completing our survey!

APPENDIX D

A Survey of Citizens about Nature: Final Dutch Version

Een Enquête over de Natuur

Wij houden een enquête onder bezoekers en bewoners van de Veluwe om meer te weten te komen over de gedachten en meningen over natuurbranden. Wij vragen u om vrijwillig deel te nemen aan deze korte en anonieme enquête. Uw medewerking wordt zeer gewaardeerd en zal ons helpen met de ontwikkeling van voorlichtings materiaal over natuurbranden.

1. Wat is op u van toepassing als het gaat over de Veluwe? (Alles aanvinken wat van toepassing is)

   ☐Ik woon hier ☐Ik heb een bedrijf hier ☐Ik ben op vakantie/een dagje uit

2. Wat omschrijft de plaats waar u opgroeide het best? (Eén aanvinken)

   ☐Stedelijk ☐Landelijk

3. Hoe vaak bent u ongeveer de natuur in geweest in de afgelopen twee jaar? (Eén aanvinken)

   ☐Nooit ☐Een paar keer per jaar ☐Een paar keer per maand ☐Eén keer per week of meer

4. Hoe vaak bent u op vakantie geweest/dagje uit op de Veluwe in de afgelopen twee jaar? (Eén aanvinken)

   ☐Nooit ☐Een paar keer per jaar ☐Een paar keer per maand ☐Eén keer per week of meer

5. Was u in de natuur, in de plaatsen waar *u de afgelopen twee jaar* op vakantie bent geweest? Heeft u daarbij informatie gekregen over het voorkomen van natuurbranden? (Omcirkel één voor A en B)

A

Vakantie in de natuur?	
Nee	Ja

B

Informatie over natuurbrand preventie ontvangen?	
Nee	Ja

6. Als u op vakantie in de natuur bent, besteedt u dan meer tijd op de camping/in het recreatiepark of in de natuur? (Eén aanvinken)

☐Camping/Recreatiepark ☐In de natuur ☐Ik ga nooit op vakantie in de natuur

7. Hoe vaak heeft u *in de afgelopen twee jaar* deelgenomen aan de volgende recreatie activiteiten in de natuur? (Alstublieft één nummer per rij omcirkelen)

	Nooit	Soms	Vaak	Dagelijks
Fietsen/Mountainbiken	1	2	3	4
Kamperen	1	2	3	4
Vliegeren	1	2	3	4
Paardrijden	1	2	3	4
Joggen/Rennen/Wandelen	1	2	3	4
Fotograferen	1	2	3	4
Picknicken	1	2	3	4
Wild kijken of bestuderen	1	2	3	4
Anders:_____ _____	1	2	3	4

8. Wat is uw ervaring met natuurbranden? (Alles aanvinken wat van toepassing is)

☐Ik heb er zelf één meegemaakt	☐Een goede vriend of iemand in mijn familie heeft er één meegemaakt	☐Ik heb over één gehoord in Nederland.	☐Ik heb over één gehoord in een ander land.	☐Ik heb geen ervaring met natuurbranden.

9. In het algemeen, hoe ernstig is de dreiging van een natuurbrand voor… (Alstublieft één nummer per rij omcirkelen)

	Helemaal niet ernstig	Een beetje ernstig	Redelijk ernstig	Heel erg ernstig

…u en uw familie?	1	2	3	4
…uw buurt?	1	2	3	4
…de inwoners van uw regio?	1	2	3	4
... de inwoners van de Veluwe?	1	2	3	4
…de inwoners van Nederland?	1	2	3	4
…planten en dieren?	1	2	3	4
…huizen en andere gebouwen?	1	2	3	4

10. Hoe groot denkt u dat de kans is dat een natuurbrand uitbreekt in Nederland binnen de komende twee jaar? (Eén aanvinken)

☐Zeer onwaarschijnlijk ☐Onwaarschijnlijk ☐Waarschijnlijk ☐Zeer waarschijnlijk ☐Weet niet

11. Wat kunt u zelf doen om natuurbranden te voorkomen?
_____
_____
_____

12. Hoeveel invloed hebben de volgende factoren op het gedrag van een natuurbrand? (Alstublieft één nummer per rij omcirkelen)

	Geen invloed	Weinig invloed	Matige invloed	Grote invloed
Temperatuur	1	2	3	4
Luchtvochtigheid	1	2	3	4
Tijd sinds laatste regenval	1	2	3	4
Bewolking	1	2	3	4

Windkracht	1	2	3	4

13. Van wie verwacht u informatie over natuurbranden? (Alstublieft alles aanvinken wat van toepassing is)

☐De rijksoverheid ☐ De gemeente ☐De politie ☐De brandweer ☐Het nieuws

14. In hoeverre bent u het eens of oneens met elk van de volgende stellingen? (Alstublieft één nummer per rij omcirkelen)

	Oneens	Neutraal	Eens	Weet niet
De natuur zijn gang laten gaan is beter dan menselijke ingrijpen in de natuur.	1	2	3	4
Het selectief kappen van dode en stervende bomen om veiligheidsredenen is beter dan ze in de natuur te laten staan.	1	2	3	4
Alle natuurbranden, ongeacht de oorzaak, moeten zo snel mogelijk geblust worden.	1	2	3	4
Bliksem veroorzaakt de meeste natuurbranden in Nederland.	1	2	3	4
Brand doodt het grootste deel van de bomen in een verbrand gebied in Nederland.	1	2	3	4
Het per ongeluk veroorzaken van brand door de mens is de grootste oorzaak van natuurbranden in Nederland.	1	2	3	4
Het selectief kappen van dode en stervende bomen om het bos mooi te houden is beter dan ze in de natuur te laten staan.	1	2	3	4
Opzettelijke brandstichting is de grootste oorzaak van natuurbranden in Nederland.	1	2	3	4
Natuurbrandgevaar is zo groot dat de brandweer alles moet doen om het te verlagen.	1	2	3	4

15. In hoeverre bent u het eens of oneens met elk van de volgende stellingen? (Alstublieft één nummer per rij omcirkelen)

	Oneens	Neutraal	Eens
Ik ben voorbereid op een natuurbrand op de Veluwe.	1	2	3
Ik moet mezelf voorbereiden op een natuurbrand.	1	2	3
Ik weet hoe ik moet evacueren tijdens een natuurbrand.	1	2	3
Ik weet wat ik kan doen om mijn eigendommen te beschermen tijdens een natuurbrand.	1	2	3
Ik weet wat ik kan doen om veilig te zijn tijdens een natuurbrand.	1	2	3
Ik weet wat ik van de hulpdiensten kan verwachten.	1	2	3
Het is de taak van de overheid mij te informeren als er een natuurbrand is.	1	2	3
Het is de taak van de overheid mij te informeren over wat ik moet doen tijdens een natuurbrand.	1	2	3
Wanneer ik de instructies van de hulpverlening opvolg loop ik geen gevaar.	1	2	3

16. Heeft u ooit naar informatie gezocht over wat u moet doen tijdens een natuurbrand? (Eén aanvinken)
    ☐Nee ☐Ja ☐Niet zeker

17. Let u meer op mogelijke brandstichters als het natuurbrandgevaar hoger is? (Eén aanvinken)

    ☐Nee ☐Ja ☐Niet zeker

18. Bent u bekend met de Kleurcodes Natuurbrandthermometer die te vinden is op www.natuurbrandgevaar.nl? (Eén aanvinken)

    ☐Nee ☐Ja

    Indien ja, antwoord alstublieft de volgende vragen. *Indien nee,* ga alstublieft verder naar vraag 21.

19. Als brandgevaar hoger is, hoe vaak bezoekt u dan de Natuurbrandthermometer om de kleur veranderingen waar te nemen?

☐ Nooit ☐Een paar keer per jaar ☐Een paar keer per maand ☐Eén keer per week of meer ☐ Ik heb me ingeschreven voor de automatische meldingen

20. Hoe groot is de kans dat u uw plannen om naar een gebied te gaan verandert als de Natuurbrandtheremometer een van de onderstaande kleuren aangeeft? (Alstublieft één nummer per rij omcirkelen)

	Zeer onwaarschijnlijk	Onwaarschijnlijk	Waarschijnlijk	Zeer waarschijnlijk
Groen	1	2	3	4
Lichtgroen	1	2	3	4
Geel	1	2	3	4
Oranje	1	2	3	4
Rood	1	2	3	4

21. Wat is uw geslacht?

☐Man ☐Vrouw

22. Wat is uw leeftijd? _____ jaar

23. In welk land woont u momenteel? _____

24. Wat is de postcode van uw huidige woonplaats? _____

Bedankt voor het invullen van onze enquête!

APPENDIX E

Postal codes from all survey respondents

Appendix E. Location, date surveyed, survey number, and postal code of all survey respondents.

Location	Date July 2015	Survey Number	Postal Code
WW	6	1	1276 ET
WW	6	2	1276 HH
WW	6	3	2802 NE
WW	6	4	3155
WW	6	5	2665
WW	6	6	2421 VB
WW	6	7	Hoofddorp 2134 XC
WW	6	8	3437 SX
WW	6	9	8731 DD
WW	6	10	6921 HT
WW	6	11	3123 AC
WW	6	12	Not Given
WW	6	13	1442 VB
WW	6	14	1827 GC Alkmaar
WW	6	15	6771 SM
WW	6	16	1231 VP
WW	6	17	1505 TC Zaandam
WW	6	18	3237 LV Vierpolders
WW	6	19	7722 KV Dalfsen
WW	6	20	7645
WW	6	21	3765 BS
WW	6	22	1623 JM
WW	6	51	6991 ZG
WW	6	52	9104 EL
WW	6	53	1447 RT
WW	6	54	9648
WW	6	55	2151 GH
WW	6	56	3945
WW	6	57	48607 Ochtrup
WW	6	58	1215 AW
WW	6	59	2742 ZN
WW	6	60	1784 RL
WW	6	61	3642
WW	6	62	2153

WW	6	63	2957 HG
WW	6	64	6721 JN
WW	6	65	3583
WW	6	66	1985 CP
WW	6	67	3069 RC
WW	6	68	1069 BX
WW	6	69	2513 VJ
WW	6	70	1069 ND
WW	6	71	2153
WW	6	72	1073 CW
WW	6	73	1501 KJ
WW	6	75	1703 PD Heerhugowaard
WW	6	76	1433 NE
WW	6	101	3833 JK
WW	6	103	1551 BK
WW	6	104	3893
WW	6	105	1902 AW
WW	6	106	9408
WW	6	107	5111 HB
WW	6	108	1502 GB
WW	6	109	2163 GB
WW	6	110	3203 AL
WW	6	111	1963 RA
WW	10	23	7242
WW	10	24	7975 AA
WW	10	25	6712 BS
WW	10	26	3771 KA
WW	10	27	7081
WW	10	28	3851 RS
WW	10	29	8347
WW	10	30	6991 HC
WW	10	31	5504 TL
WW	10	32	6822
LB	18	801	3295
LB	18	802	2343 KC
LB	18	803	6731 SM
LB	18	804	1033 VK
LB	18	805	1033 CX

LB	18	807	1069
LB	18	808	1851 AV
LB	18	809	1431 TZ
LB	18	810	3141
LB	18	811	2984
LB	18	812	8302 CN
LB	18	813	3828 SL
LB	18	814	9934 KA Delfzijl
LB	18	815	2034 CX
LB	18	816	1566 VG Assendelft
LB	18	817	6731 SM
LB	18	818	1338
LB	18	890	6731
LB	18	891	6731
LB	18	892	7333
LB	18	893	6721
LB	18	894	1971 KX
LB	18	895	2662 AN
LB	18	896	1971 DJ
LB	18	897	3905 AK
LB	18	898	3771 GO
LB	18	899	1097 CH
LB	18	900	4697 GJ
LB	18	632	3067 NE
LB	18	633	1181 EG
LB	18	634	2741 XG
LB	18	635	1628 CH
LB	18	636	1724 TC
LB	18	637	2022 BM
LB	18	638	7418
LB	18	639	3038 CS
LB	18	640	6717 BM
LB	18	641	6882
LB	18	642	7316 KL
LB	18	644	Not Given
LB	18	645	2991 NJ
LB	18	646	2729 JC
LB	18	647	3901 TD

LB	18	648	2727 HL
LB	18	649	5665 GR
WH	9	184	6705 BE
WH	9	185	6705
WH	9	186	Wageningen
WH	9	187	6705 BE
WH	9	189	6705 AK
WH	9	190	6705 AK
WH	9	191	6705 AN
WH	9	192	6705 AT
WH	9	193	6705 AK
WH	9	195	6705
WH	9	196	6705 AK
WH	9	197	6705 AK
WH	9	198	6705 AS
WH	9	199	6705
WH	9	200	6705
WH	9	201	6705
WH	9	202	6705
WH	9	203	6705 BE
WH	9	204	6705
WH	9	205	6705 BC
WH	9	206	6705 BC
WH	9	207	6705 BC
WH	9	208	1214
WH	9	209	6705 BC
WH	9	210	6705 BC
WH	9	211	6705 BC
WH	9	212	6705 BD
WH	9	221	6705 AG
WH	9	222	6705
WH	9	223	6705 AG
WH	9	229	6705 AH
WH	9	259	6705 AB
WH	9	260	6705 AB
WH	9	261	6705 AX
WH	9	262	6705 AE
WH	9	264	6705 AZ

WH	9	265	6705 CL Wageningen
WH	9	266	6705 CK
WH	9	267	6705 CL
WH	13	401	6705 BS
WH	13	402	6705
WH	13	403	6705
WH	13	406	6705 BX
WH	13	408	6705 BX
WH	13	409	6705 CL
WH	13	411	6705 BX
WH	13	412	6705 CG
WH	13	502	6705 CE
WH	13	504	6705
WH	13	505	6705
WH	13	506	6705 CE 2A
WH	13	507	6705 CG
WH	13	508	6705 CE
WH	13	509	6705 Wageningen -Hoog
WH	13	510	6705 CH
WH	13	511	6705 CH
WH	13	550	6705
WH	13	551	6705 BZ
WH	13	552	6705 BZ
WH	13	553	6705 BZ
WH	13	554	67 (Wageningen-Ede)
WH	13	555	6705 CA
WH	13	557	6705 CX
WH	13	558	6705 CV
WH	13	559	6705 CW
WH	13	560	6705 CW
WH	13	562	6705 CW
WH	13	563	6705 CW
WH	13	564	6705 CS
WH	13	565	6705 CS
WH	13	566	6705 CT
WH	13	567	6705 CS
WF	7	112	in NL: 6874 AW
WF	7	113	6874 AW

WF	7	114	6874 AW
WF	7	115	6874 AW
WF	7	116	6874 AW
WF	7	117	6874 AW Wolfheze
WF	7	118	6874 AW
WF	7	119	6874 AW
WF	7	120	6874
WF	7	121	6874 AW
WF	7	122	6874 AW
WF	7	124	6874 AW
WF	7	125	6874 AW
WF	7	126	6874
WF	7	127	6874 AW Wolfheze
WF	7	128	6874 AW
WF	7	129	6874 AW
WF	7	130	6874 AW
WF	7	131	6874 AW
WF	7	133	6874 AW
WF	7	134	6874 AW
WF	7	135	6874 AW
WF	7	136	6874
WF	7	137	6874 AW
WF	7	138	6874 AW
WF	7	139	6874 AW
WF	7	140	6874 AW
WF	7	141	6874 AW
WF	7	142	6874
WF	7	143	6874
WF	15	581	6874 AG
WF	15	582	6874 AU
WF	15	583	6874 AL
WF	15	585	6874 AL
WF	15	586	6874 Al
WF	15	587	6874 AS
WF	15	588	6874 AS
WF	15	589	6874 AS
WF	15	590	6874 AV
WF	15	591	6874 AV

WF	15	592	6874
WF	15	593	6874 BD
WF	15	594	6874 BD
WF	15	595	6874
WF	15	596	6874 AT
WF	15	597	6478 BC
WF	15	598	6874 AP
WF	15	445	6874 AB
WF	15	446	6874
WF	15	447	6874 AJ
WF	15	448	6874 AJ
WF	15	449	6874
WF	15	450	6874 BL
WF	15	451	6874 BM
WF	15	452	6874
WF	15	454	6874
WF	15	556	6705
JT	19	901	7545, Enschede
JT	19	902	7955
JT	19	903	1447 CC Purmerend
JT	19	904	1381
JT	19	905	1231
JT	19	907	1508 AA
JT	19	909	2671
JT	19	910	2522 GV
JT	19	911	3131 RV
JT	19	912	8042
JT	19	913	3863 DR
JT	19	914	3752 JB
JT	19	915	7245
JT	19	916	6841 KC
JT	19	917	5702 NX
JT	19	918	6605
JT	19	919	4724 ER
JT	19	920	7416 BP
JT	19	921	3742
JT	19	922	8701
JT	19	923	1035

JT	19	924	8191 XP
JT	19	925	5081
JT	19	926	Not Given
JT	19	927	3861 CT
JT	19	928	47589
JT	19	929	3437 GC Nieuwegein
JT	19	930	6991 EB
JT	19	931	8000 XE
JT	19	932	3861
JT	19	933	8071
JT	19	934	2561
JT	19	935	4791 BP
JT	19	936	5235 GV
JT	19	937	7545
JT	19	938	5348
JT	19	939	8815 AS
JT	19	940	3741
JT	19	941	7326 RS
JT	19	942	3317
JT	19	943	4001 RD
JT	19	945	1628 RA
JT	19	946	3402 HB
JT	19	947	1112 PK
JT	19	948	Not Given
JT	19	949	Den Haag
JT	17	E53	35020
JT	17	E59	Not Given
JT	17	E60	96022
JT	17	601	3831 PW
JT	17	602	3237
JT	17	603	3328 ZA Dordrecht
JT	17	604	1241 VR
JT	17	605	3813
JT	17	606	3351 AM
JT	17	607	2725 AE
JT	17	608	3853
JT	17	609	7424 CL
JT	17	610	1432 HL

JT	17	611	2678 AA
JT	17	612	6721 GM
JT	17	615	4101 JD
JT	17	616	6733
JT	17	618	3762 JS
JT	17	621	2548
JT	17	625	3991 Houten
JT	17	626	1121 ES
JT	17	627	3079 JG
JT	17	628	1112 NH
JT	17	629	2908 AE
JT	17	631	2927 AR
JT	17	673	Rotterdam
JT	17	670	7548 EG
JT	17	672	3515 CV
JT	17	674	2986 TS
JT	17	675	4147
JT	17	677	7325 JK
JT	17	679	6012
JT	17	680	2902
JT	17	681	3201
JT	17	682	3245 RA
JT	17	684	6733
JT	17	685	2274 LH
JT	17	687	5102 ZA
JT	17	689	2200
JT	17	693	2563 SB Den Haag
JT	17	702	1339
JT	17	703	1223
JT	17	704	9943 PB
JT	17	705	1703 EP
JT	17	706	2931
JT	17	707	9403 XV
JT	17	708	6716 EZ
JT	17	709	5041
JT	17	710	3772
JT	17	712	7555 EK
JT	17	713	3438

JT	17	714	1622 CM Hoorn
JT	17	715	3888
JT	17	716	3132
JT	17	717	3911
JT	17	718	3841
JT	17	719	6942 HT
JT	17	720	3075 WE
JT	17	721	2831
JT	17	722	Not Given
JT	17	723	3206 NK
JT	17	724	1611
JT	17	725	8167 LS
JT	17	726	1066
JT	17	728	2406
JT	17	729	1218 AX
JT	17	730	6846 KN
JT	17	731	Lelystad
JT	17	732	8226
JT	17	733	3083
JT	17	734	2971 AB Bleskensgraaf
JT	17	735	1611 DH
JT	17	736	8224
JT	17	737	8266 LG
JT	17	738	2611
JT	17	739	2406 Alphen aan de Rijn
JT	17	740	3706 BH
JT	17	741	2012 EE
JT	17	742	2691 ZH
JT	17	743	2512
JT	17	744	Not Given
JT	17	745	1400
JT	17	746	7328 DE Apeldoorn
JT	17	747	3135 AR
JT	17	748	3972 SV
JT	17	749	3704 EV
JT	17	750	8016 DH
JT	17	751	3812
JT	17	752	1448 SP

JT	17	753	6713
JT	17	760	1325 GT
JT	17	788	7451
JT	17	789	3956 GH
JT	17	790	2726 BM
JT	17	791	3811
JT	17	792	2406 EL
JT	17	793	3016 BM
JT	17	795	9007 HR
JT	17	796	7051 WV
JT	17	797	8042 EM
JT	17	799	8435
JT	17	800	6641 EW
JT	17	851	1211 AE 33
JT	17	852	3903 TL
JT	17	853	Not Given
JT	17	854	7314
JT	17	855	7321 ZW Apeldoorn
JT	17	856	2292
JT	17	857	3927
JT	17	858	3825 XD
JT	17	859	3823 HG
JT	17	860	2642 CL
JT	17	861	7601
JT	17	862	Apeldoorn
JT	17	863	3826
JT	17	864	3434 TA Nieuwegein
JT	17	865	8014
JT	17	866	8021 AC
JT	17	867	7334
JT	17	868	3162
JT	17	869	9741 GE
JT	17	870	7351 BP Hoenderloo
JT	17	871	3962 XX Wijk bij Duurstede
JT	17	872	7683
JT	17	873	Den Haag
JT	17	874	7206 HD
JT	17	875	3328 ZD

JT	17	876	6715
JT	17	877	7891 PX Klazienaveen
JT	17	879	4051 BN
JT	17	881	2266
JT	17	884	6629 AX
JT	17	885	7915 VB Hollanscheveld
JT	17	886	8020 CC
JT	17	887	7207 RK
JT	17	888	6714 JX
JT	17	889	2170
AP	16	E5	47589
AP	16	E6	47167
AP	16	E9	Not Given
AP	16	E10	E1E1B7
AP	16	33	1060 PP
AP	16	34	5046 DR
AP	16	35	2251
AP	16	38	7827 SG
AP	16	39	9356 DA 22
AP	16	40	3204 AD
AP	16	42	9746 BH
AP	16	44	3812
AP	16	47	3544 ZB
AP	16	49	1442
AP	16	50	9403
AP	16	268	1823 AJ
AP	16	269	9722 AR
AP	16	270	9421 NH
AP	16	271	3824 DK
AP	16	272	2404
AP	16	273	6151 LD
AP	16	277	8043 MB
AP	16	278	3734 GD
AP	16	279	Hengelo
AP	16	280	2986 PD
AP	16	283	2566
AP	16	302	1421 LL
AP	16	303	6641

AP	16	304	9363
AP	16	308	6544 Nijmegen
AP	16	310	7333
AP	16	314	3670
AP	16	320	8245 ER
AP	16	321	7412 ML
AP	16	332	2681
AP	16	335	9646 Veendam
AP	16	338	7331 MG
AP	16	339	1723 XP
AP	16	341	1471 CC
AP	16	342	7323 PC
AP	16	351	2496 PX
AP	16	353	9482 RH
AP	16	357	3881 PD Putten
AP	16	360	3207
AP	16	363	3902 DC
AP	16	364	7576 BX
AP	16	368	7312 NA
AP	16	370	2713 RM
AP	16	373	1562 BR
AP	16	378	1197 CJ
AP	16	380	1508
AP	16	384	9611 MR
AP	16	387	6045 NR
AP	16	391	2404 GP
AP	16	399	6301
AP	16	400	Winschoten
AP	16	426	3646 BB
AP	16	427	2914 XB
AP	16	437	7331 AB
AP	16	438	3527 VB
AP	16	440	2982 VN
AP	16	460	8337
AP	16	462	6658
AP	16	463	7321 ZM
AP	16	465	5122 HA
AP	16	466	3123 RR

AP	16	468	Not Given
AP	16	469	9417
AP	16	476	5271
AP	16	479	9115
AP	16	482	1761 W
AP	16	485	1628
AP	16	486	5343 GT
AP	16	489	6971
AP	16	491	1013
AP	16	496	7321
AP	16	498	3083 DC Rotterdam
AP	16	569	2560
AP	16	570	2675 BJ
AP	16	571	2719 VA
AP	16	577	6562 RB
AP	16	580	1705 GH

*WW = Wije Werelt, LB = Lorkenbos, WH = Wageningen-Hoog, WF = Wolfheze, JT = Julianatoren, AP = Apenheul

VITA

Amy Brennan, daughter of James and Donna Brennan, was born in Beaumont, Texas on June 18th, 1992. Upon graduating from Hardin-Jefferson High School in 2010, Amy attended Stephen F. Austin State University to study forestry. Immediately following the completion of her Bachelor's of Science in Forestry in 2014, Amy enrolled in graduate school at Stephen F. Austin State University.

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APA Style

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